

ACADEMIC REGULATIONS, RULES, STUDY PLANS & COURSE DESCRIPTION FOR UNDERGRADUATE STUDIES (FACULTY OF COMPUTER SCIENCE)

اللوائح والقواعد الأكاديمية والخطط الدراسية والمحتوي العلمي لمقررات مرحلة البكالوريوس (كلية علوم الحاسب)



ACADEMIC REGULATIONS AND RULES FOR UNDERGRADUATE STUDIES (FACULTY OF COMPUTER SCIENCE) اللوائح والقواعد الاكاديمية لمرحلة البكالوريوس

كلية علوم الحاسب

ARTICLE 1: VISION

The Faculty of Computer Science – Benha National University (BNU) looks forward to being leading programs in the Computer Science education fields at the local, regional, and international levels. مادة (۱): رؤىة الكلية

تتطلع كلية علوم الحاسب بجامعة بنها الأهلية أن تكون كلية رائدة في مجالات التعليم في علوم الحاسب على المستوى القومي والإقليمي والدولي

ARTICLE 2: MISSION

The Faculty of Computer Science – BNU is committed to graduating professions equipped with the knowledge, mental and professional skills that enable them to compete at the local, regional, and international levels in the framework of human and moral values.

مادة (٢): رسالة الكلية

تلتزم كلية علوم الحاسب بجامعة بنها الأهلية بإعداد خريجين مزودين بالمهارات المعرفية والعقلية والمهنية التي تمكنها من المنافسة على المستوى المحلي والإقليمي والدولي في إطار القيم الإنسانية والأخلاقية.

ARTICLE 3: IMPORTANT DEFINITIONS

- Academic Year: two regular semesters and a summer semester, if any.
- Academic Semester: a period of no less than Sixteen (16) weeks of instruction, including final examination period while excluding the registration period.
- Summer Session: a period not exceeding eight (8) weeks of instruction, excluding the registration and final examination periods. The weekly duration of each course in a summer session is twice its duration during the regular academic semester.
- Academic Level: indicates the level of study, in accordance with the specifications of the approved degree program.
- **Study plan:** Is a set of obligatory, elective, and free courses, which constitute the total credits required for graduation that must a student pass successfully to obtain the degree in the selected specialization.

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- **Course:** a subject of study within a certain academic level of the approved degree study plan in each major. Each course has a distinguished number, code, title, and a detailed description of its contents. A portfolio on each course is kept in its corresponding department for follow-up, evaluation, and updates. Some courses may have prerequisite or corequisite requirement(s).
- **Credit Hour:** the student obtains a number of credit hours according to the number of contact hours in the week, and the contact hour is calculated as follows:

Class	Actual Time	Credit Hours
Lecture	One hour	1
Tutorial	Two or three hours 1	
Lab	Two or three hours 1	

- Academic Probation: a notification given to a student with a cumulative GPA below the minimum acceptable limit as explained in these regulations.
- **Classwork Score:** The score which reflects the student's standing during a semester according to his/her performance in examinations, research, and other activities related to the course.
- Final Examination: An examination in course materials, given once at the end of each semester.
- **Final Examination Score:** The score attained by a student in the final examination for each course.
- **Final Score:** The total sum of the classwork score plus the final examination score for each course out of a total grade of 100.
- **Course Grade:** A percentage, or alphabetical letter assigned to a student which indicates the final grade received in a course.
- **Incomplete Grade (IC):** the letter grade (IC) in the academic record indicates a provisional grade in which a student fails to complete the course requirements by the end of a specific date.
- In-progress Grade (IP): The letter grade (IP) indicates a provisional grade assigned to each course which requires more than one semester to be completed.
- Semester GPA: The total quality points a student has earned, divided by the credit hours assigned for all courses taken in each semester. Total quality points are calculated by multiplying the credit hours by the grade point in each course.
- **Cumulative GPA (CGPA):** The total quality points a student has earned in all courses taken since enrolling at the university divided by the total number of credit hours assigned for these courses.



- **Graduation Ranking:** The assessment of a student's scholastic achievement during his study at the college.
- **Study load:** Total number of credit hours a student can register determined by his/her academic status, and in accordance with the faculty Council decisions.
- **Transcript:** It is a record showing a student's academic path at the program and the courses he/she has studied in each semester, along with their codes, numbers, credit hours and grades. It also includes other transferred courses finished by the student in another university or another program at the university, together with the semester average and GPA.
- **Pre-requisite:** This is a course which must be completed before registering other courses according to the educational program.
- **Probation:** The student is placed under probation if he/she scores a GPA below 2.0 in any regular semester, and this requires the reduction of his/her educational load.
- Academic Advisor: The academic advisor is a staff member or a teaching assistant who is assigned the supervision of a group of students in addition to guiding and helping them in choosing what is appropriate to their abilities and interests. In addition, the academic advisor clarifies the plans, courses and tracks in the program for students so that they can take decisions to plan for their studies and achieve their aspired academic goals. A student should refer to the academic advisor to consult him/her as regards any educational issues.
- Academic Level of the Student: If the student completed 25% of the graduation requirements, this considered as a transfer from the current level to the higher level (levels are from 1 to 4). This does not require determining the quality or the level of courses completed by the student.

مادة (٣): تعريفات مهمة

- السنة الدراسية: فصلان رئيسيان وفصل صيفى واحد إن وجد.
- الفصل الدراسي الرئيسي: مدة زمنية لا تقل عن ستة عشر أسبوعاً تدرس خلالها المقررات الدراسية وتشمل فترة الاختبارات النهائية، ولا تدخل من ضمنها فترة التسجيل.
- الفصل الصيفي: مدة زمنية لا تزيد على ثمانية أسابيع ولا تدخل من ضمنها فترتا التسجيل والاختبارات النهائية، وتضاعف خلالها الساعات الأسبوعية المخصصة لكل مقرر.
 - المستوى الدراسي: هو الدال على المرحلة الدراسية وفقا للخطط الدراسية المعتمدة.
- الخطة الدراسية: هي مجموعة المقررات الدراسية الإجبارية والاختيارية، والتي تشكل من مجموع وحداتها متطلبات التخرج التي يجب على الطالب اجتيازها بنجاح للحصول على الدرجة العلمية في التخصص المحدد.
- المقرر الدراسي: مادة دراسية ضمن الخطة الدراسية المعتمدة في كل تخصص. ويكون لكل مقرر رقم ورمز واسم ووصف مفصل لمفرداته يميزه من حيث المحتوى، والمستوى عما سواه من مقررات، وملف خاص يحتفظ به البرنامج لغرض المتابعة والتقييم والتطوير، ويجوز أن يكون لبعض المقررات متطلب أو متطلبات سابقة.



 الساعة المعتمدة: أن يحصل الطالب على عدد ساعات معتمدة طبقا لعدد ساعات الإتصال في الأسبوع، و تحسب ساعة الإتصال كالتالى:

الساعة المعتمدة	مدة الدرس	الدرس
)	ساعة	المحاضرة
١	ساعتين أو ثلاث ساعات	حصص التمارين
١	ساعتين أو ثلاث ساعات	حصص المعامل

- الإنذار الأكاديمي: الإشعار الذي يوجه للطالب بسبب انخفاض المعدل التراكمي عن الحد الأدنى الموضح في هذه اللائحة.
- درجة الأعمال الفصلية (اعمال السنة): الدرجة الممنوحة للأعمال التي تبين تحصيل الطالب خلال فصل دراسي من اختبارات وبحوث وأنشطة تعليمية تتصل بالمقرر الدراسي.
 - الاختبار النهائي: اختبار في المقرر يعقد مرة واحدة في نهاية الفصل الدراسي.
 - درجة الاختبار النهائي: الدرجة التي يحصل عليها الطالب في كل مقرر في الاختبار النهائي للفصل الدراسي.
- الدرجة النهائية: مجموع درجات الأعمال الفصلية مضافاً إليها درجة الاختبار النهائي لكل مقرر، وتحسب الدرجة من مائة.
 - التقدير: وصف للنسبة المئوية أو الرمز الأبجدي للدرجة النهائية التي حصل عليها الطالب في أي مقرر.
- درجة غير مكتملة (IC): تشير الدرجة بالحرف (غم) في السجل الأكاديمي إلى درجة مؤقتة يفشل فيها الطالب في إكمال متطلبات المقرر بنهاية تاريخ محدد.
- درجة مكملة (IP): تشير الدرجة بالحرف (مك) في السجل الأكاديمي إلى درجة مؤقتة تُخصص لكل مقرر يتطلب إكماله أكثر من فصل دراسي.
- المعدل الفصلي: حاصل قسمة مجموع النقاط التي حصل عليها الطالب على مجموع الساعات الدراسية المعتمدة المقررة لجميع المقررات التي درسها في أي فصل دراسي، وتحسب النقاط بضرب الساعات الدراسية المعتمدة في وزن التقدير الذي حصل عليه في كل مقرر درسه الطالب.
- المعدل التراكمي: أصل قسمة مجموع النقاط التي حصل عليها الطالب في جميع المقررات التي درسها منذ التحاقه بنظام الساعات المعتمدة بالجامعة على مجموع الساعات الدراسية المعتمدة لتلك المقررات.
 - ترتيب التخرج: تقييم التحصيل الدراسي للطالب أثناء دراسته في الكلية.
- العبء الدراسي: مجموع الساعات الدراسية المعتمدة التي يسمح للطالب التسجيل فيها في فصل دراسي ويتحدد الحد الأعلى والأدنى للعبء الدراسي حسب القواعد المذكورة لاحقا.
- السجل الأكاديمي: هو سجل يوضح المسار الأكاديمي للطالب في البرنامج والمقررات التي درسها في كل فصل دراسي، إلى جانب الأكواد، والساعات المعتمدة والدرجات. ويشمل أيضًا المقررات التي تم معادلتها للطالب التي أنهاها في جامعة أخرى أو في برنامج آخر في الجامعة، مع المعدل الفصلي والمعدل التراكمي.
 - متطلب سابق: هو مقرر يجب إكماله قبل تسجيل مقرر أخر طبقا للبرنامج التعليمي.
- المراقبة: يوضع الطالب تحت المراقبة إذا حصل على معدل تراكمي أقل من ٢,٠ في أي فصل دراسي رئيسي، وهذا يتطلب تقليل العبء التعليمي.
- المرشد الأكاديمي: هو عضو هيئة تدريس أو هيئة معاونة مكلف بالإشراف على مجموعة من الطلاب بالإضافة إلى توجيههم ومساعدتهم في اختيار ما يناسب قدراتهم واهتماماتهم. كما يوضح المرشد الأكاديمي الخطط والمقررات والمسارات في البرنامج للطلاب حتى يتمكنوا من اتخاذ قرارات التخطيط لدراساتهم وتحقيق أهدافهم الأكاديمية المنشودة. على الطالب مراجعة المرشد الأكاديمي لاستشارته في أي موضوع تعليمي.



 المستوى الأكاديمي للطالب: إذا أكمل الطالب ٢٥٪ من متطلبات التخرج، فيعتبر ذلك بمثابة انتقال من المستوى الحالي إلى المستوى الأعلى (المستويات من ١ إلى ٤). هذا لا يتطلب تحديد جودة أو مستوى المقررات التي أكملها الطالب.

ARTICLE 4: ADMISSION OF PROSPECTIVE STUDENTS

- 4.1. The admission is permitted for the students that meet the following requirements:
 - Completion of secondary education certificate in mathematics, or in sciences, or equivalent certificates according to the requirements of the Supreme Council of Universities or the Private and Community Universities Council.
 - Students of sciences must pass the corresponding course of Math 2 for students of mathematics in secondary education certificate.
 - Meeting the minimum score required to join the program, which is announced before the beginning of the academic year, considering the annually announced terms, regulations and qualifying courses per certificate as specified by the Supreme Council of the Egyptian Universities.
- 4.2. Students are enrolled at the start of the two main semesters only.
- 4.3. The applicant must satisfy any other requirements specified by the Supreme Council of the Egyptian Universities at the time of application.
- 4.4. Selection from among applicants, who satisfy all the admission requirements, is based on their grades in secondary school examinations, as well as the results of the interviews and the admission examinations, if any, and within the framework of what is approved by the Supreme Council of Private and National Universities
- 4.5. Students who have a bachelor's degree from a practical college from an Egyptian university or its equivalent are allowed to enroll in one of the programs offered by the college in accordance with the conditions set by the University Council, provided that the study is from the first level without equivalency to any previously studied courses.

مادة (٤): شروط القيد والالتحاق

- ١-٤. يسمح بقيد الطلاب الذين يستوفون الشروط التالية:
- إتمام شهادة الثانوية العامة علمي رياضيات أو علمي علوم أو ما يعادلها من الشهادات وفق متطلبات المجلس الأعلى للجامعات أو مجلس الجامعات الخاصة والأهلية.
 - يجب على طلاب علمي علوم اجتياز مقرر الرياضيات ٢ المقابل لطلبة الرياضيات في شهادة التعليم الثانوي.
- استيفاء الحد الأدنى من الدرجات المطلوبة للالتحاق بالبرنامج ، والذي يتم الإعلان عنه قبل بداية العام الدراسي ، مع مراعاة الشروط واللوائح والدورات التأهيلية المعلنة سنويًا لكل برنامج على النحو الذي يحدده المجلس الأعلى للجامعات المصرية.
 - ٢-٤. يتم قيد الطلاب في بداية الفصول الرئيسية فقط (الربيع والخريف).
 - ٣-٤. يجب أن يستوفى المتقدم أي متطلبات أخرى يحددها المجلس الأعلى للجامعات المصرية وقت تقديم الطلب.



- ٤-٤. يتم الاختيار من بين المتقدمين، الذين يستوفون جميع شروط القبول، بناءً على درجاتهم في امتحانات الثانوية
 العامة، وكذلك نتائج المقابلات وامتحانات القبول، إن وجدت، وفي إطار ما يقره المجلس الأعلى للجامعات
 الخاصة والأهلية
- ٤-٥. يسمح للطلاب الحاصلين على درجة البكالوريوس من أحد الكليات العملية من الجامعات المصرية او ما يعادلها بالالتحاق بأحد البرامج التي تقدمها الكلية طبقا للشروط التي يضعها مجلس الجامعة شريطة ان تتم الدراسة من المستوى الأول دون معادلة أي مقررات تم دراستها سابقا

ARTICLE 5: SYSTEM OF STUDY

- 5.1. The study system at the university is the credit hours system and the study within the programs is in English.
- 5.2. The program makes (if required) an English language examination for the new participated students to determine their level in English. The student who did not pass the examination must join an intensive English language course at the beginning of the 1st semester of the 1st level and allowed to reenter the examination at the beginning of the next semester until he/she passes.

مادة (٥): نظام الدراسة

- ١-٥. نظام الدراسة في الجامعة هو نظام الساعات المعتمدة والدراسة بالبرامج باللغة الإنجليزية.
- ٢-٥. يقوم البرنامج (إذا لزم الأمر) بإجراء امتحان في اللغة الإنجليزية للطلاب المشاركين الجدد لتحديد مستواهم في اللغة الإنجليزية. الطالب الذي لم ينجح في الامتحان يجب أن يلتحق بدورة لغة إنجليزية مكثفة في بداية الفصل الأول من المستوى الأول ويسمح له بإعادة الاختبار في بداية الفصل التالي حتى ينجح.

ARTICLE 6: ACADEMIC YEAR AND DURATION OF STUDY

- 6.1. The academic year of the University starts at the third week of September and concludes by the end of August of the following calendar year. For all undergraduate programs, the academic year normally includes two semesters, each of which consists of 16 weeks of academic work. An Academic Calendar with dates of important University activities during the academic year is issued for ready reference.
- 6.2. The duration of the study in the programs is eight (8) main semesters (at least 6 main semesters).
- 6.3. The maximum study duration for the enrolled student, at the program, is eight (8) academic years.

مادة (٦): السنة الدراسية ومدة الدراسة

١-٦. تبدأ السنة الدراسية للجامعة في الأسبوع الثالث من شهر سبتمبر وتنتهي بنهاية شهر أغسطس من العام الميلادي التالي، وبالنسبة لجميع البرامج تشتمل السنة الأكاديمية عادةً على فصلين دراسيين ، يتكون كل منهما من ١٥ أسبوعًا من ١٥ أسبوعًا من العام الدراسي للرجوع من العمل الأكاديمي. يتم إصدار التقويم الأكاديمي مع تواريخ الأنشطة الجامعية الهامة خلال العام الدراسي للرجوع إليها بسهولة.



٢-٦. مدة الدراسة في البرامج ثمانية (٨) فصول دراسية رئيسية (على الأقل ٦ فصول رئيسية).
 ٣-٦. الحد الأقصى لمدة الدراسة للطالب المسجل في البرنامج ثماني (٨) سنوات أكاديمية.

ARTICLE 7: ATTENDANCE AND WITHDRAWAL

- 7.1. A regular student is required to attend lectures and laboratory sessions. If his/her attendance is less than the 75% the lectures and laboratory sessions assigned for each course, the student will be barred from continuing the course and will be denied entrance to the respective final examination. A student who is denied entrance to the examination due to absences is considered to have failed that course and is given the grade (DN) in the course.
- 7.2. The faculty council may exempt a denied student from the provisions of attendance and allow him/her to take the examination, provided that the student presents an acceptable excuse to the council. However, the denied student must achieve at least 50% of attendance of the lectures and laboratory sessions specified for the course.
- 7.3. A student who is absent for a final examination, will be given a zero grade for that examination. His/her grade in the course will be calculated based on the class work score he/she obtained over the semester.
- 7.4. If a student fails to attend a final examination in any course but offers a compelling excuse, the faculty council may choose to accept his/her excuse and allow him/her to take a make-up examination. The make-up examination must be taken prior to the end of the following semester. In such cases, the course grade will be given to the student after the make-up examination.
- 7.5. Student may withdraw from the study of a course or more, without his/her being considered as having failed the courses, if he/she presents an acceptable excuse to the authorized body specified by the faculty council at least five weeks prior to the beginning of the final examinations. Under exceptional circumstances, the faculty Council may extend the permitted deadline for withdrawal and assign a (W) grade to the student. This semester will be included in the period required for completion of the program degree.

مادة (٧): المواظبة والانسحاب

- ١-٧. يجب على الطالب المنتظم حضور المحاضرات والمعامل والتمارين. ويُمنع الطالب من استكمال المقرر ومن دخول الامتحان النهائي للمقرر، إذا قلت نسبة حضوره عن ٧٥٪ من المحاضرات والتمارين والمعامل المخصصة لكل مقرر، ويُعتجر النهائي يُحرم من دخول الامتحان بسبب الغياب راسبًا في ذلك المقرر ويُمنح تقدير (DN) في المقرر.
- ۲-۷. لمجلس الكلية إعفاء الطالب المحروم بسبب عدم الحضور والسماح له بإجراء الاختبار، شريطة أن يقدم الطالب عدرًا معبولاً للمجلس. وفي جميع الاحوال، يجب أن يحقق الطالب نسبة ٥٠٪ على الأقل من حضور المحاضرات والتمارين والمعامل المحددة للمقرر.
- ٣-٧. الطالب الذي يتغيب عن امتحان نهائي، يعطى علامة صفرية لهذا الاختبار، وسيتم احتساب درجته في المقرر بناءً على درجة أعمال السنة التي حصل عليها خلال الفصل الدراسي.



- ٧-٤. إذا عجز الطالب عن حضور الامتحان النهائي في أي مقرر، ولكنه قدم عذرًا مقنعًا، يجوز لمجلس الكلية قبول عذره والسماح له بإجراء اختبار تعويضي. يجب إجراء الامتحان التعويضي قبل نهاية الفصل الدراسي التالي وفي مثل هذه الحالات، سيتم منح تقدير المقرر كاملا للطالب بعد الامتحان التعويضي.
- ٥-٧. يجوز للطالب الانسحاب من دراسة مقرر أو أكثر دون اعتبار رسوبه في المقررات، إذا قدم عذرًا مقبولاً للجهة المنوطة التي يحددها مجلس الكلية قبل خمسة أسابيع على الأقل من بداية الامتحانات النهائية. في ظل ظروف استثنائية، يجوز لمجلس الكلية تمديد الموعد النهائي المسموح به للانسحاب وتخصيص درجة (W) للطالب. ويتم ادراج هذا الفصل الفصل الدراسي ضمن الفترة المطلوبة لاستكمال التخرج من البرنامج.

ARTICLE 8: POSTPONEMENT AND INTERRUPTION OF STUDIES

- 8.1. A student may postpone study for reasons determined acceptable by the faculty Council. The postponement duration cannot be more than two consecutive regular semesters or three nonconsecutive regular semesters as maximum during his/her study at the University; otherwise, he/she will be dismissed from the University. The University Council may make exceptions when it deems necessary. The postponed period is not included in the period required for completion of the program degree.
- 8.2. If a regular student interrupts his/her studies for more than one semester without submitting a postponement application in advance within a period of (13) weeks from the start of the semester, he/she will be dismissed from the University.
- 8.3. A student is not considered to have interrupted his/her studies during those semesters when he/she is a visiting student at another university.

مادة (٨): التأجيل والانقطاع عن الدراسة

- ١-٨. يجوز للطالب تأجيل الدراسة لأسباب يقررها مجلس الكلية، بحيث لا تزيد مدة التأجيل عن فصلين دراسيين متتاليين أو ثلاثة فصول دراسية غير متتالية كحد أقصى خلال دراسته في الجامعة؛ وخلاف ذلك، يتم فصله من الجامعة. ويجوز لمجلس الجامعة الاستثناء من الشروط السابقة عندما يرى ضرورة لذلك. ولا يتم تضمين الفترة المؤجلة في الفترة المطلوبة لإكمال التخرج من البرنامج.
- ٢-٨. إذا انقطع الطالب المنتظم عن دراسته لأكثر من فصل دراسي دون تقديم طلب تأجيل مسبقاً خلال فترة (١٦) أسبوع من بداية الدراسة، فيتم فصله من الجامعة.
 - ٨-٣. لا يعتبر الطالب قد انقطع عن دراسته خلال تلك الفصول الدراسية عندما يكون طالباً زائراً في جامعة أخرى.

ARTICLE 9: RE-ENROLLMENT

- 9.1. A student whose enrollment is cancelled may apply for re-enrollment using the same university ID number and academic record he/she had before cancellation of his/her enrollment, according to the following regulations:
 - He/She must apply for re-enrollment within four regular semesters from the date of dismissal.



- The faculty council and the University Council must approve the reenrollment.
- Four or more semesters have lapsed since he/she interrupts his/her studies from the University; the student can apply to the University for admission as a new student without consideration of his/her old academic record if he/she fulfills all the admission requirements announced at the time of application.
- A student can be granted re-enrollment only once. The University Council may make exceptions when it deems necessary.
- A student cannot be re-enrolled if he/she has been on probation prior to his/her cancellation of enrollment.
- 9.2. A student who has been dismissed from the University for academic or disciplinary reasons, or who has been dismissed from another university for disciplinary reasons, will not be granted readmission. If it becomes evident after admission that he/she was dismissed for such reasons, his/her readmission is considered canceled from the date of readmission.

مادة (٩): إعادة القيد

- ١-٩. يجوز للطالب الذي تم إلغاء قيده التقدم بطلب لإعادة القيد باستخدام نفس الرقم الجامعي والسجل
 الأكاديمي الذي كان لديه قبل إلغاء تسجيله، وفقًا للشروط التالية:
 - يجب عليه التقدم بطلب لإعادة القيد خلال أربعة فصول دراسية رئيسية من تاريخ الفصل.
 - يجب أن يوافق مجلس الكلية ومجلس الجامعة على إعادة القيد.
- وفي حالة انقضاء أكثر من أربعة فصول دراسية منذ قطع دراسته من الجامعة؛ يمكن للطالب
 التقدم للجامعة للقبول كطالب جديد دون النظر إلى سجله الأكاديمي القديم إذا استوفى جميع شروط القبول المعلنة وقت تقديم الطلب.
 - يمكن إعادة قيد الطالب مرة واحدة فقط، ولمجلس الجامعة الاستثناء عندما يرى ضرورة لذلك.
 - لا يمكن إعادة قيد الطالب إذا كان في فترة المراقبة قبل إلغاء قيده.
- ۲-۹. لا يسمح بإعادة قيد الطالب الذي تم فصله من الجامعة لأسباب أكاديمية أو تأديبية، أو تم فصله من جامعة أخرى لأسباب تأديبية. وإذا اتضح بعد إعادة قيد الطالب بأنه تم فصله لهذه الأسباب، فإن إعادة القيد تعتبر ملغية من تاريخ إعادة القيد.

ARTICLE 10: GRADUATION

- 10.1. Student graduates after successfully completing all graduation requirements according to the study program, provided that his/her cumulative GPA is not less than two (2) out of four (4).
- 10.2. If the student has passed the required courses but his/her cumulative GPA is less than two (2), the faculty Council, based on the recommendations of the



board of the program concerned, is entitled to specify the appropriate courses that the student must complete to improve his/her GPA.

مادة (١٠): التخرج

- ۱۰۱۰. يتخرج الطالب بعد إتمام جميع متطلبات التخرج بنجاح، حسب البرنامج الدراسي، بشرط ألا يقل معدله التراكمي عن اثنين (۲) من أصل أربعة (٤).
- ۲-۱۰. إذا اجتاز الطالب المقررات المطلوبة، ولكن معدله التراكمي أقل من اثنين (۲)، يحق لمجلس الكلية بناءً على توصيات مجلس البرنامج المعنى تحديد المقررات المناسبة التي يجب على الطالب إكمالها لتحسين معدله التراكمي.

ARTICLE 11: DISMISSAL FROM THE UNIVERSITY

- 11.1. A student will be dismissed from the University in either of the following situations: -
 - The student receives a maximum of six consecutive academic probations for having a cumulative GPA lower than 2.00 out of 4.00. Based on the recommendations of the faculty Council, the University Council may grant another chance to a student who can improve his/her cumulative GPA by studying the courses available.
 - A student fails to complete the graduation requirements within a maximum of eight (8) academic years.
 - The University Council may make an exception and give students falls under the two previous situations the opportunity to complete their studies within an additional period of two semesters.

مادة (١١): الفصل من الجامعة

- ۱-۱۱. يفصل الطالب من الجامعة في أي من الحالات التالية: -
- ٥ حصول الطالب على ست إنذارات أكاديمية متتالية إذا قل معدله التراكمي عن ٢,٠٠ من ٤,٠٠. بناءً على توصيات مجلس الكلية، يجوز لمجلس الجامعة منح فرصة أخرى للطالب الذي يمكنه تحسين معدله التراكمي من خلال دراسة المقررات المتاحة.
 - فشل الطالب في استكمال متطلبات التخرج في مدة أقصاها ثماني (٨) سنوات أكاديمية.
- يجوز لمجلس الجامعة إجراء استثناء وإعطاء الطلاب السابق ذكرهما في الحالتين السابقتين فرصة لإكمال دراستهم خلال فترة إضافية بحد أقصى فصلين دراسيين.

ARTICLE 12: EXAMINATIONS AND SCORES

12.1. The score for each course is distributed according to the following table: -

Examination	Timing	Grade %



Midterm Exam. #1	7 th week	15%
Midterm Exam. #2	12 th week	15%
Semester's Work		30%
Final Exam.	15 th week	40%

- 12.2. The semester's work score is evaluated by oral and practical examinations, research, quizzes and other class activities.
- 12.3. Based upon the recommendation of the board of the program offering the course, the faculty Council may include practical or oral tests in final examination of any course and allocates percentage to these tests as part of the final examination score.
- 12.4. For project courses and the courses of a field work nature, the Semester's work represents 60% of the total score, while the Final Presentation & Discussion represents 40% of the total score. The faculty Council specifies the ways to evaluate student achievement in such courses.
- 12.5. Based on the recommendations of the course instructor, the board of the program that offers the course may allow a student to complete the requirements of any course in the following semester. In such a case, an 'IC' grade is recorded in the student's academic record. The student's grade in the course will not be included in the calculation of the semester or cumulative GPA until he/she completes the course requirements and earns a grade. If the IC grade is not changed in the academic record after the lapse of one semester because the student does not complete the course, the IC status will be automatically changed to an 'F' grade and will be included in the calculation of the semester and cumulative GPAs.
- 12.6. Appendix (A) shows examples of the calculation of semester and cumulative GPA.

مادة (١٢): الاختبارات والدرجات

الدرجات الخاصة بكل مقرر تبعا للجدول التالي:	۱-۱۱. توزع
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% الدرجة	التوقيت	الاختبار
10	الأسبوع السابع	امتحان منتصف الفصل (١)
10	الأسبوع الثاني عشر	امتحان منتصف الفصل (٢)
۳.		أعمال فصلية
٤.	الأسبوع الخامس عشر	امتحان نهائي

- ٢-١٢. يتم تقييم درجات الأعمال الفصلية عن طريق الامتحانات الشفوية والعملية، والبحوث، والاختبارات القصيرة وأنشطة الفصل الأخرى.
- ٢-١٢. بناءً على توصية مجلس البرنامج التابع له المقرر، يجوز لمجلس الكلية دمج الاختبارات العملية أو الشفوية في الاختبار النهائي لأي مقرر ويخصص نسبة لهذه الاختبارات كجزء من درجة الاختبار النهائي.



- ٤-١٢. بالنسبة لمقررات المشروع والمقررات ذات طبيعة التدريب الميداني، تمثل الاعمال الفصلية ٦٠٪ من إجمالي درجات المقرر، بينما يمثل العرض النهائي والمناقشة ٤٠٪ من إجمالي الدرجات. ويحدد مجلس الكلية طرق تقييم الطلاب في مثل هذه المقررات.
- ١٢-٥. بناءً على توصية أستاذ المقرر، يجوز لمجلس البرنامج السماح للطالب باستكمال متطلبات أي مقرر مسجله الطالب في الفصل الدراسي التالي. في مثل هذه الحالة، يتم تسجيل درجة "غير مكتمل" "IC" في السجل الأكاديمي للطالب. لن يتم تضمين تقدير الطالب في المقرر الدراسي في حساب المعدل في الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على تقدير به. إذا لم يتم تغيير درجة "كا" حال" في الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على تقدير الطالب في حساب المعدل الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على تقدير به. إذا لم يتم تغيير درجة "كا" في الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على تقدير به. إذا لم يتم تغيير درجة حال الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على وي مستكمل المقرر، فسيتم تغيير حرامة الفصلي أو المعدل التراكمي من تقديم متطلبات المقال ويحصل على تقدير به. إذا لم يتم تغيير درجة "كا" في الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على تقدير به. إذا لم يتم تغيير درجة "كا" في الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على تقدير به. إذا لم يتم تغيير درجة الفصلي أو المعدل التراكمي حتى يكمل متطلبات المقرر ويحصل على تقدير به. إذا لم يتم تغيير درجة "كا" في السجل الأكاديمي بعد مرور فصل دراسي واحد لأن الطالب لم يستكمل المقرر، فسيتم تغيير حالة "كا" وي السجل الأكاديمي بعد مرور فصل دراسي واحد لأن الطالب الم يتما المعدل التراكمي.
 - ٦-١٢. يوضح ملحق (أ) أمثلة لحساب المعدل الفصلى والمعدل التراكمي.

ARTICLE 13: GRADES

Points	Grade Code	Percentage
4.00	A+	From 96% and more
3.70	A	From 92% less than 96%
3.40	A-	From 88% less than 92%
3.20	B+	From 84% less than 88%
3.00	В	From 80% less than 84%
2.80	B-	From 76% less than 80%
2.60	C+	From 72% less than 76%
2.40	С	From 68% less than 72%
2.20	C-	From 64% less than 68%
2.00	D+	From 60% less than 64%
1.50	D	From 55% less than 60%
1.00	D-	From 50% less than 55%
0.00	F	Less than 60%

13.1. The grades earned by students in each course are calculated as follows: -

- 13.2. The other non-credit grades and its description are listed in Appendix (B).
- 13.3. Descriptive Grade (Semester average/ Cumulative average):

GPA	Descriptive Grade
3.5 up to 4.0	Excellent
From 3.0 to less than 3.5	Very Good
From 2.5 to less than 3.0	Good
From 2.0 to less than 2.5	Pass
From 1.0 to less than 2.0	Fail



مادة (١٣): تقديرات المقررات

۱-۱۳. تقدر نقاط كل ساعة معتمدة للمقرر للطالب طبقا للجدول التالى:

النسبة المئوية	التقدير	عدد النقاط
۹۲٪ فأعلى	A+	٤,
من ۹۲٪ وحتى اقل من ۹۲٪	A	۳,۷۰
من ۸۸٪ وحتی اقل من ۹۲٪	A-	٣,٤٠
من ۸٤٪ وحتى اقل من ۸۸٪	B+	۳,۲۰
من ۸۰٪ وحتی اقل من ۸٤٪	В	۳,۰۰
من ۷٦٪ وحتى اقل من ٨٠٪	В-	۲٫۸۰
من ۷۲٪ وحتی اقل من ۷۲٪	C+	۲,٦٠
من ٦٨ ٪ وحتى اقل من ٧٢٪	С	۲,٤٠
من ٦٤ ٪ وحتى ا <mark>قل من</mark> ٦٨ ٪	C-	۲,۲۰
من ٦٠٪ وحتى اقل من ٢٤٪	D+	۲,
من ٥٥٪ وحتى اقل من ٦٠٪	D	1,0.
من ٥٠٪ وحتى اقل من ٥٥٪	D-	١,
اقل من ٥٠٪	F	•,••

- ٢-١٣. يتم ذكر الدرجات الأخرى التي ليس لها نقاط أو ساعات معتمدة ووصفها في الملحق (ب).
 - ٣-١٣. تمنح التقديرات التي يحصل عليها الطالب عند تخرجه طبقا للجدول التالي:

التقدير المناظر	المعدل التراكمي
امتياز	۳٫٥ فأكثر
جيد جدا	من ۳٫۰ إلى أقل من ۳٫٥
جيد	من ۲٫۵ إلى أقل من ۳٫۰
مقبول	من ۲٫۰ إلى أقل من ۲٫٥
ضعيف	من ۱٫۰ إلى أقل من ۲٫۰
ضعيف جدا	أقل من ١

ARTICLE 14: COURSES REGISTRATION

14.1. The student must register the courses in each semester and must meet the registration requirements in each course. After consultation with the academic advisor, the registration dates and rules issued by the program will be published annually and published in the student's guide.



- 14.2. A student who has a cumulative GPA less than 1.00 is not allowed to register for more than 12 credit hours in the next semester.
- 14.3. The student who did not registered a course or courses within the registration period, is not allowed to register the courses, unless there is a place, and the faculty council may decide the delay registration fees in addition to the fees of the educational service prescribed.
- 14.4. Students may not register in any course unless they have completed its prerequisites. Graduating students are an exception and are only granted that after the concerned program coordinator and academic supervisor studies their cases.

CGPA	Maximum academic Load (Credit Hours)
from 3.00 or more	21
from 2.00 to less than 3.00	18
from 1.00 to less than 2.00	15

14.5. The maximum academic load that can be registered is as follows: -

- 14.6. The minimum academic load that can be registered is 9 credit hours, except for graduating students.
- 14.7. Final year students (last two semesters) may increase the academic load to 21 credit hours. The board of the program must examine each of those cases individually.
- 14.8. Students can register courses from higher semesters to complete their academic load, if they complete the course prerequisites (if any). If students are unable to register their allotted academic load, available courses suffice even if the minimum number of hours is not reached.
- 14.9. The student can register up to six (6) credit hours in the summer semester and can be promoted to a maximum of nine (9) credit hours at the recommendation of the academic advisor.

مادة (١٤): تسجيل المقررات

- ١-١٤. يجب عـلى الطالب تسـجيل المقررات في كـل فصـل دراسي ويجب أن يسـتوفي شروط التسـجيل في كـل مقرر بعـد التشاور مع المرشـد الأكاديمي. ويـتم نشر_ مواعيـد التسـجيل والقواعـد الصادرة عـن البرنامج سنويًا ونشرها في دليل الطالب.
- ريد و ي ي ي ... ٢-١٤. لا يسمح للطالب الحاصل على معدل تراكمي أقل من ١,٠٠ بالتسجيل لأكثر من ١٢ ساعة معتمدة في الفصل الدراسي التالي.
- ٢-١٤. لا يجوز للطالب الذي لم يسجل مقررًا أو مقررًا خلال فترة التسجيل تسجيل المقررات إلا إذا كان هناك سعة طلابية في المقرر، وللمجلس الكلية أن يقرر رسوم تأخير التسجيل بالإضافة إلى رسوم الخدمة التعليمية المقررة.



- ٤-١٤. لا يجوز للطلاب التسجيل في أي مقرر ما لم يكملوا متطلباتها السابقة. يتم استثناء الطلاب المتوقع تخرجهم في أخر فصل دراسي لهم بعد أن يدرس منسق البرنامج المختص والمشرف الأكاديمي حالاتهم ويوافق عليها.
 - ٥-١٤. الحد الأقصى للعبء الأكاديمي المسموح بتسجيله طبقا للجدول التالي:

الحد الأقصى لساعات التسجيل المعتمدة	المعدل التراكمي
۲۱	۳٫۰ فأكثر
١٨	من ۲٫۰ إلى أقل من ۳٫۰
10	من ۱٫۰ إلى أقل من ۲٫۰

- ٦-١٤. الحد الأدنى من العبء الأكاديمي الذي يمكن تسجيله هو ٩ ساعات معتمدة، باستثناء الطلاب
 الخريجين.
- ٧-١٤. يمكن لطلاب السنة النهائية (آخر فصلين دراسيين) زيادة العبء الأكاديمي إلى ٢١ ساعة معتمدة. ويجب على مجلس إدارة البرنامج فحص كل حالة على حدة.
- ٨-١٤. يمكن للطلاب تسجيل المقررات من المستويات الاعلى من أجل استكمال العبء الأكاديمي، إذا أكملوا متطلبات المقرر (إن وجدت). إذا لم يتح للطالب التسجيل كاملاً نظراً للعبء الدراسي من مواد المستويات الأعلى، يستكفي بالمقررات المتاحة حتى إذا لم يتم الوصول إلى الحد الأدنى لعدد الساعات.
- ٩-١٤. يمكن للطالب تسجيل ما يصل إلى ست (٦) ساعات معتمدة في الفصل الصيفي ويمكن زيادتها إلى
 تسع (٩) ساعات معتمدة كحد أقصى بناءً على توصية المرشد الأكاديمي.

ARTICLE 15: COURSE REPEAT

- 15.1. A student is considered to have failed a course if he/she obtains (F) according to the grading scheme.
 - Failure result (F) for any course shall be registered in the student's transcript and is counted in the calculation of the semester average and cumulative GPA, whether the course is core or elective.
 - A student must re-register for core courses which he/she fails. When he/she passes the course, the highest grade a student can receive is B.
- 15.2. If the student fails for the second time in the exam of a repeated course, the failure grade is only counted in the semester average.
- 15.3. A student may repeat any course he/she has already passed if he/she wishes to improve his/her GPA with a maximum of five courses during his period of study, provided that this is done at least one full main semester before the graduation semester. The number of retaken courses can increase more than five in case of removing the under probation.



15.4. A student may not repeat a course for improvement after more than one complete academic year (two regular semesters + summer semester) has passed, unless he/she is under probation and if recommended by the academic advisor.

مادة (١٥): إعادة المقررات

١-١٥. يعتبر الطالب راسبًا في مادة ما إذا حصل على (F) وفقًا لنظام الدرجات التالي:

- تسجل نتيجة الرسوب (F) لأي مقرر في كشف درجات الطالب وتحسب في حساب
 المعدل الفصلى والمعدل التراكمي سواء كان المقرر أساسيًا أو اختياريًا.
- يجب على الطالب إعادة التسجيل في المقررات التي يرسب فيها. وعندما يجتاز المقرر،
 فإن أعلى درجة يمكن أن يحصل عليها الطالب هي (B).
- ٢-١٥. إذا رسب الطالب للمرة الثانية في امتحان مقرر معاد، تحسب علامة الرسوب فقط في المعدل الفصلي.
- ٣-١٥. يجوز للطالب إعادة أي مقرر اجتازه بالفعل إذا كان يرغب في تحسين معدله التراكمي بحد أقصى-خمس مقررات خلال فترة دراسته على أن يتم ذلك قبل فصل التخرج بفصل دراسي رئيس كامل علي الأقل، ويمكن أن يزيد عدد مقررات التحسين عن خمسة في حالة الرغبة في الغاء المراقبة.
- ٤-١٥. لا يجوز للطالب إعادة مقرر للتحسين بعد مرور أكثر من عام دراسي كامل (فصلين دراسيين عاديين + فصل صيفي)، ما لم يكن تحت المراقبة، وإذا أوصى بذلك المرشد الأكاديمي.

ARTICLE 16: TRANSFER

- 16.1. The transfer of a student from outside the University may be accepted under the following conditions:
 - The student should have studied at a recognized college or university.
 - The student must not have been dismissed from that university for disciplinary reasons.
 - The student must satisfy the transfer conditions, as determined by the University Council and the Supreme Council of Egyptian Universities.
- 16.2. The faculty Council evaluates the courses that were taken by the student outside the University, based on the recommendations of the board of the program that offer equivalent courses. The courses evaluated as equivalent are recorded in the student's academic transcript and included in the calculation of his/her cumulative GPA.
- 16.3. If it becomes evident, after a student's transfer, that the student was dismissed for disciplinary reasons, his/her enrollment is considered cancelled from the date of acceptance of his/her transfer to the University.
- 16.4. The transfer of a student from one university to another during any semester takes place in accordance with the procedures and the dates announced by



the university to which the student is transferring, according to the general rules governing transfer.

- 16.5. A student may transfer from one program to another within the University in accordance with the rules endorsed by the University Council and with the scientific opinion of the program board.
- 16.6. All courses that have been studied by a student transferred from one program to another are recorded in his/her academic record, including the grades and the semester and cumulative GPAs obtained throughout his/her study at the respective University.
- 16.7. A student may transfer from one major to another within the university, in accordance with the rules established by the University Council.

مادة (١٦): التحويل

- ١-١٦. تحويل الطالب من خارج الجامعة لابد أن يخضع للاشتراطات التالية:
 - أن يكون الطالب محول من كلية او جامعة معترف بها.
- ألا يكون الطالب مفصول من الجامعة المحول منها لأسباب تأديبية.
- أن يحقق الطالب شروط التحويل الموضوعة من قبل المجلس الأعلى للجامعات.
- ٢-١٦. يتم معادلة المقررات التي تم دراستها خارج الكلية من قبل مجلس الكلية بعد توصية مجلس إدارة. البرنامج. تضاف المقررات التي تم معادلتها الي السجل الأكاديمي كما تضاف لحساب المعدل التراكمي.
- ٣-١٦. إذا تم اكتشاف أن الطالب المحول تم فصله لأسباب تأديبية، يتم إلغاء التحاقه بالجامعة من تاريخ قبول تحويله للجامعة.
- ٤-١٦. يـتم نقـل الطالـب مـن جامعـة إلى أخـرى خـلال أي فصـل دراسي وفـق الإجـراءات والمواعيـد الـتي تعلنهـا الجامعة المحول إليها، وفق القواعد العامة التي تحكم التحويل.
- ٥-١٦. يجوز للطالب الانتقال من برنامج إلى آخر داخل الجامعة وفق الضوابط التي يقرها مجلس الجامعة، ووفقاً للرأي العلمي لمجلس ادارة البرنامج
- ٦-١٦. يتم تسجيل جميع المقررات التي درسها الطالب المنقول من برنامج إلى آخر داخل الجامعة في سجله الأكاديمي، بما في ذلك الدرجات والفصل الدراسي والمعدلات التراكمية التي حصل عليها خلال دراسته في الجامعة
- ٧-١٦. يجوز للطالب الانتقال من تخصص إلى آخر داخل الجامعة وفق الضوابط التي يضعها مجلس الجامعة.

ARTICLE 17: VISITING STUDENTS

- 17.1. A "visiting student" is a student who studies courses at another university or in any Branch of the University to which he/she belongs without transferring. These courses are considered equivalent to those offered at the University, according to the following rules:
 - The student must obtain the approval of his/her program before he/she begins his/her studies.



- His/Her studies should be at a recognized college or university.
- The course the student takes outside his/her university should be equivalent, in terms of content, to a course required for graduation.
- The University Council determines the maximum credit hours to be allocated to a visiting student from outside the University.
- The course grades credited to the visiting student will be recorded in his/her academic record, but not included in the calculation of his/her cumulative GPA.
- 17.2. Any other conditions required by the University Council should be satisfied.

مادة (١٧): الطلاب الزائرين

- ١٠١٧. الطالب الزائر هـو الطالب الـذي يـدرس مقـررات في جامعـة أخـرى أو في أي فـرع مـن فـروع الجامعـة الـتي ينـتمي إليها دون أن ينتقـل. تعتبر هـذه المقـررات معادلـة للمقـررات المطروحـة في الجامعـة وفـق القواعـد التالية:
 - يجب على الطالب الحصول على الموافقة من برنامجه قبل أن يبدأ دراسته.
 - أن تكون دراسته في كلية أو جامعة معترف بها.
- يجب أن يكون المقرر الذي يأخذه الطالب خارج جامعته معادل من حيث المحتوى لمقرر ملزم لتخرجه.
 - يحدد مجلس الجامعة الحد الأقصى للساعات المعتمدة للطالب الزائر من خارج الجامعة.
- يتم تسجيل درجات المقرر الدراسي للطالب الزائر في سجله الأكاديمي، ولكن لا يتم تضمينها في حساب المعدل التراكمي الخاص به.
 - ۲-۱۷. يجب استيفاء أي شروط أخرى يضعها مجلس الجامعة.

ARTICLE 18: GUEST STUDENTS

- 18.1. Students who are enrolled at any other university may be registered as guest students. As a rule, this registration should not exceed two semesters except in justified cases.
- 18.2. Any other conditions required by the University Council should be satisfied.

مادة (١٨): الطلاب الضيوف

- ١-١٨. يمكن للطلاب المسجلين في أي جامعة أخرى أن يتم تسجيلهم كطلاب ضيوف. ويجب ألا يتجاوز هذا التسجيل فصلين دراسيين إلا في حالات مبررة.
 - ۲-۱۸. يجب استيفاء أي شروط أخرى يضعها مجلس الجامعة.

ARTICLE 19: EXCHANGE STUDENTS



- 19.1. Students who are enrolled at any non-Egyptian partner university (exchange partners) may be registered as exchange students for a defined period, usually for up to two semesters. Students who register as exchange students receive full student status.
- 19.2. All credits and study achievements are transferrable.
- 19.3. Any other conditions required by the University Council should be satisfied.

مادة (١٩): طلاب التبادل

- ١-١٩. يمكن للطلاب المسجلين في أي جامعة مصرية أو غير مصرية (بناء على برتوكول تعاون بين الجامعتين) أن يتم تسجيلهم كطلاب تبادل لفترة محددة، تصل إلى فصلين دراسيين. ويحصل الطلاب الذين يسجلون كطلاب تبادل على حالة الطالب الكاملة.
 - ۲-۱۹. يتم نقل جميع الساعات المعتمدة والاستحقاقات الدراسية.
 - ٣-١٩. يجب استيفاء أي شروط أخرى يضعها مجلس الجامعة.

ARTICLE 20: BACHELOR'S DEGREES

Benha National University (BNU) grants, upon the request of the faculty Council, the Bachelor of Computer Science (B.Sc.) degree in one of the following computer science disciplines: -

- Artificial Intelligence and Machine Learning
- Computational Linguistics
- o Data Science
- o Software and Application Development
- Virtual and Augmented Reality.

The BNU can add new academic computer science programs and grants new bachelor's degrees after fulfilling the requirements demanded by the Supreme Council of Egyptian Universities.

مادة (٢٠): درجات البكالوريوس

تمنح جامعة بنها الأهلية بناءً على طلب مجلس الكلية درجة بكالوريوس علوم الحاسب في أحد تخصصات الحاسبات التالية: -

- الذكاء الاصطناعي وتعلم الآلة
 - اللغويات الحاسوبية
 - علوم البيانات
- تطوير البرمجيات والتطبيقات
 - الواقع الافتراضي والمعزز.



يمكن للجامعة إضافة برامج أكاديمية جديدة ومنح درجات بكالوريوس جديدة في علوم الحاسب بعد استيفاء المتطلبات التي يطلبها المجلس الأعلى للجامعات المصرية.

ARTICLE 21: HONOR DEGREE

- 21.1. The honor degree is granted to the student who has earned a cumulative GPA between 3.30 and 4.00 at the time of his/her graduation.
- 21.2. A student who is eligible for honor degree also must meet the following criteria:
 - He/she must not have failed any course completed at the University or any other university.
 - He/she must have completed all graduation requirements during a period not exceeding (8) semesters.
 - He/she must have completed 60% or more of the graduation requirements at the university from which he/she is graduating.

مادة (٢١): مرتبة الشرف

١-٢١. تمنح مرتبة الشرف للطالب الذي حصل على معدل تراكمي بين ٣,٣٠ و٤,٠٠ وقت تخرجه.

- ٢-٢١. يجب على الطالب المؤهل للحصول على مرتبة الشرف أيضًا أن يستوفى المعايير التالية:
 - ألا يكون قد رسب في أي مقرر تم دراسته في الجامعة أو أي جامعة أخرى.
- أن يكون قد أكمل جميع متطلبات التخرج خلال مدة لا تزيد عن (٨) فصول دراسية.
 - أن يكون قد درس وأتم ٦٠٪ أو أكثر من متطلبات التخرج في جامعة بنها الاهلية.

ARTICLE 22: OFFENSES AND DISCIPLINARY AND ACADEMIC PENALTIES

In case a student commits an offense, the disciplinary penalties are as follows:

22.1. First: Violations of exam regulations and academic integrity:

These range from dismissal from the examination hall to final expulsion from the university. This is decided through presenting the case to the faculty council as follows:

#	Student Offense	Offense Description Penalty
	Disobeying	Disrupting the discipline or quietness of After the invigilator gives oral
	examination	the exam hall. For example: warning when the offense is
1	instructions	Repetition (more than once) of committed for the first time
1		talking to a colleague during the only, the student is dismissed
		exam. from the exam and allocated
		"zero" for the given exam.



		BNU	
		 Repetition (more than once) of showing a switched off mobile 	
		phone during the exam	
		Repetition (more than once) of the	
		ringing of a mobile phone	
	Refusing to carry	Repetition of any of the offenses	The student is dismissed
	out instructions	mentioned in item number (1) in any	from the examination hall
2		other subject during the exam period.	and the grade allocated to
			the subject is "F".
	Cheating	Using any cheating methods. For	The student fails the subject
		example:	in question. In addition, the
		A switched-on mobile phone is not	grades allocated to the two
		switched off and contains course	subsequent subjects (or the
		information.	two previous ones in case the
		An unauthorized paper slip, table,	subject is the last one in the
		notes or any other means or tools	student's exam schedule)
R		with course information.	should be "W".
5		Exchanging answer or questions	
		sheet with a colleague during the	
		exam.	
		Exchanging tools with information	
		about the subject with a colleague	
		during the exam.	
		Failing to observe the required	
		regulations for university integrity.	
	Offending the	Offending the invigilator or the exams	The student fails all courses
	invigilator or the	supervision authority whether verbally or	registered for the semester
	exam supervision	physically.	during which the offense
	authority verbally		occurs (grades allocated to all
	or physically		subjects should be "F"). In
			registration for the following
4			semester is suspended. The
			case is then forwarded to the
			university council to
			determine whether the
			student is to continue his/her
			studies at the university or
			not.
	Impersonation of	Impersonation of another student to sit for the	Final expulsion from the
	another student	exam instead of him/her.	University.
5	to sit for the exam		
	l		
	instead of		



- It is permissible to apply the strictest penalty which can be expulsion from the university in case another contravention accompanied the process of documenting the one the student is penalized for. This is decided by the university council after referring to the faculty council.
- In all the above-mentioned cases, an official report of the case (the offense) should be written.
- The student's questions and answer sheets (after filling in all necessary information), as well as any other evidence related to the incident, should be attached, and sent with related documents to the program's coordinator.
- The penalty is added to the student's unofficial transcript.

22.2. Second: General Behaviour Offenses:

The penalties for general behaviour offenses range from warning to final expulsion. This is decided by presenting the case to the faculty council (such as smoking in classes or corridors, damaging the university properties, disrupting the discipline of lectures and tutorials).

مادة (٢٢): المخالفات والعقوبات التأديبية والأكاديمية

في حال ارتكب الطالب مخالفة تكون العقوبات التأديبية كما يلي:

1-۲۲. أولا: مخالفات لوائح الامتحان والنزاهة الأكاديمية:

تتراوح هـذه المخالفـات مـن الطـرد مـن قاعـة الامتحـان إلى الفصـل النهـائي مـن الجامعـة. ويتقـرر ذلـك مـن خـلال عرض الحالة على مجلس الكلية على النحو التالي:

العقوبة	وصف المخالفة	المخالفة	#
بعد أن يعطي المراقب إنذارًا شفهيًا عند ارتكاب المخالفة لأول مرة فقط، يطرد الطالب من الاختبار ويحصل على درجة "صفر" في الاختبار المحدد.	تعطيل الانضباط أو هدوء قاعة الامتحان. علي سبيل المثال: • تكرار (أكثر من مرة) التحدث إلى زميل أثناء الامتحان. • تكرار (أكثر من مرة) إظهار هاتف نقال مغلق أثناء الامتحان. • تكرار رنين الهاتف المحمول (أكثر من مرة).	مخالفة تعليمات الامتحان	1
يُطرد الطالب من قاعة الامتحان ويعطي تقدير "F"للمقرر.	تكـرار أي مــن المخالفـات الــواردة في البنــد رقــم (١) في أي مادة أخرى خلال فترة الامتحان.	رفض تنفيذ التعليمات	2
رسوب الطالب في المقرر بالإضافة إلى حرمان الطالب من مقررين تاليين (أو المادتين السابقتين في حال كان المقرر هو الأخير في جدول امتحان الطالب).	 استخدام أي طرق الغش. علي سبيل المثال: الهـاتف المحمـول غـير المغلـق ويحتـوي عـلى معلومات المقرر. أوراق، أو ملاحظـات، أو أي وسـيلة، أو أدوات أخرى غير مصرح بدخولها الامتحان. تبادل الإجابات أو ورقة الأسـئلة مع زميـل أثناء الامتحان. تبـادل أدوات بهـا معلومـات حـول موضـوع الامتحان. 	الغش	3



	 عـدم مراعـاة اللــوائح المطلوبــة للنزاهــة الجامعية. 		
رسوب الطالب في جميع المقررات المسجل للفصل الذي وقعت فيه المخالفة (الدرجات المخصصة لجميع المواد يجب أن تكون "F"). بالإضافة إلى تعليق تسجيل الطالب للفصل الدراسي التالي ثم يتم إحالة الحالة إلى مجلس الجامعة لتحديد ما إذا كان الطالب سيواصل دراسته في الجامعة أم لا.	إهانة المراقب أو المشرف علي العملية الامتحانية لفظيا أو جسديا.	إهانة المراقب أو المشرف علي العملية الامتحانية لفظيا أو جسديا	4
الفصل النهائي من الجامعة.	انتحال شخصية طالب آخر لحضور للامتحان بدلاً منه.	انتحال شخصية طالب آخر لحضور للامتحان بدلاً منه	5

- يجوز توقيع العقوبة الأشد التي يمكن أن تصل الى الفصل من الجامعة في حالة وجود مخالفة أخرى عند تحرير محضر المخالفة التي يعاقب عليها الطالب. ويقرر ذلك مجلس الجامعة بعد الرجوع لمجلس الكلية.
 - في جميع الحالات المذكورة أعلاه يجب تحرير محضر رسمي عن الحالة (المخالفة).
- يجب إرفاق أسئلة الطالب وأوراق الإجابة (بعد ملء جميع المعلومات اللازمة)، وكذلك أي دليل آخر يتعلق بواقعة المخالفة، وإرسالها مع المستندات ذات الصلة إلى منسق البرنامج.
 - يتم وضع العقوبة في ملف الطالب.

٢-٢٢. ثانيا: مخالفات السلوك العام

تتراوح عقوبات مخالفات السلوك العام من الإنذار إلى الفصل النهائي. يتم تحديد ذلك من خلال عرض الحالة على مجلس الكلية (مثل التدخين في الفصول، أو الممرات، أو الإضرار بممتلكات الجامعة، أو تعطيل نظام المحاضرات والدروس).

ARTICLE 23: ADDITIONAL RULES

- 22.1. The faculty Council may, upon the proposal of the Program Council, amend the registration requirements and scientific content (with no more than 25% of the content) for any course.
- 22.2. The faculty Council shall be presented with all the subjects for which no provision has been made in the articles of this regulation. It may be necessary to apply to the University to approve the decision of the faculty Council.
- 22.3. The Law of the Egyptian National Universities shall be applied in the absence of any regulations not listed.

مادة (٢٢): قواعد إضافية

- ١-٢٢. يجوز لمجلس الكلية بناء على اقتراح مجلس البرنامج تعديل متطلبات التسجيل والمحتوى العلمي (بما لا يزيد عن ٢٥% من المحتوى لأي مقرر من المقررات الدراسية)
- ٢-٢٢. يعرض على مجلس الكلية كافة الموضوعات التي لم يرد في شأنها نص في مواد هذه اللائحة، وقد يتطلب الامر الرفع الى الجامعة للتصديق على قرار مجلس الكلية.



BNU ٣-٢٢. يطبق فيما لم يردبه نص في هذه اللائحة وتعديلاتها الأحكام الواردة بقانون تنظيم الجامعات وتعديلاته.





APPENDIX (A)

EXAMPLES OF THE CALCULATION OF SEMESTER AND CUMULATIVE GPA

First Semester:

Course	Credit Hours	%	code	GPA	Quality Points
BAS001	3	75	C+	2.60	7.80
GEN001	2	82	В	3.00	6.00
ISE003	3	66	C-	2.20	6.60
MEC101	4	90	A-	3.40	13.60
Total	12	-	-	-	34

First Semester GPA = $\frac{\text{Total Quality Points}}{\text{Total Credits}} = \frac{34}{12} = 2.83$

Second Semester:

Course	Credit Hours	%	code	GPA	Quality Points
BAS006	3	50	D-	1.00	3.00
GEN002	2	73	C+	2.60	5.20
ISE004	3	88	A-	3.40	10.20
MEC201	3	68	С	2.40	7.20
MEC202	3	83	В	3.00	9.00
Total	14	-	-	-	34.60

Second Semester GPA =
$$\frac{\text{Total Quality Points}}{\text{Total Credits}} = \frac{34.6}{14} = 2.47$$

Cumulative GPA = $\frac{34+34.60}{12+14}$ = 2.64





<u>ملحق (أ)</u> أمثلة لحساب المعدل الفصلي والتراكمي

الفصل الأول:

عدد النقاط	المعدل	التقدير	%	الساعات المعتمدة	المقرر
7.80	2.60	C+	75	3	عهس۲۰۰
6.00	3.00	В	82	2	عام
6.60	2.20	C-	66	3	صنع۲۰۰
13.60	3.40	A-	90	4	میك۱۰۱
34	-	-	-	١٢	الإجمالي

المعدل الفصلي للفصل الأول= اجمالي عدد النقاط = 12 / 34 = ٢,٨٣

الفصل الثاني:

عدد النقاط	المعدل	التقدير	%	الساعات المعتمدة	المقرر
3.00	1.00	D-	50	3	عهس٢٠٠
5.20	2.60	C+	73	2	عام۲۰۰
10.20	3.40	A-	88	3	صنع٢٠٠٤
7.20	2.40	С	68	3	میك۲۰۱
9.00	3.00	В	76	3	میک۲۰۲
34.60	-	-	-	14	الإجمالي

$$1,72 = \frac{34+34.6}{12+14} = 1,72 = 1,72$$





APPENDIX (B)

TABLE OF OTHER NON-CREDIT GRADES

Grade	Significance	Description					
I	Incomplete	It is the grade of a postponed final exam due to					
		an urgent excuse accepted by college. An					
		incomplete result (I) is given to enable the					
		student to sit for the final exam in the assigned					
		date. Otherwise, the student is considered to					
		have failed the course.					
W	Withdrawn	It is the grade of a course that has been					
DN	Devial	withdrawn. It is not counted in the GPA.					
DN	Denial	Any undergraduate who fails in a course because					
		a disciplinary verdict. Consider as E on GPA					
		calculate if the student repeats the course the					
		grade will not be changed to the letter "B" on					
		the transcript, it will be as a letter "DN" and the					
		new grade will be added to the next semester					
		GPA.					
RT	Retake	Any undergraduate student may retake a course					
		for which he/she passed and received a grade					
		below a B (A student may exercise this option					
		for no more than five courses, totaling no more					
		than 15 credit hours). Student to benefit from					
		the retake policy his/her new grade must not be					
		F or DN.					
RP	Repeat	If the student fails in a course, he/she must					
		repeat it. When he/she passes the course, the					
		highest grade a student can receive is B.					
NC	Non-Credit	Units for courses which are graded with a "P"					
		(Pass) or "NP" (No Pass) will not be included in					
		the student's GPA calculation. Units for courses					
		toward the student's degree requirements					
		those with grades "NP" will not					
IP	In-Progress	A student who does not complete a course by					
		the end of the semester and his/her					



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	Grade	Significance	Description			
			project/work will require an extension to the			
			next semester. The final grade will be reported			
			to the student after he/she finishes all			
			requirements of the course.			
Ī	AU	Audit	The student was given permission to audit this			
			course. After the last day of late registration (last			
			day of drop/add), students may not transfer			
			from audit to credit status. Students may change			
			from credit to audit up to the official withdrawal			
			date.			





ملحق (ب)

جدول التقديرات بدون ساعات معتمدة

التوصيف	المعني	التقدير
هو تقدير اختبار نهائي مؤجل نتيجة لعذر طارئ مقبول من الكلية. تعطي تلك النتيجة	غير مكتمل	IC
لتسمح للطالب حضور الامتحان النهائي في الموعد المحدد والا الطالب يعتبر راسب في		
المقرر.		
هو تقدير مقرر تم الانسحاب منه ولا تضاف للمعدل التراكمي	منسحب	w
هو تقدير مقرر تم حرمان الطالب منه نتيجة لتجاوزه حد الغياب المسموح به أو نتيجة	محروم	DN
لعقوبة ما. ويتم اعتبار الطالب راسب بالمقرر عند حساب المعدل. عند إعادة المقرر،		
ستظل التقدير كما هو في السجل الأكاديمي والتقدير الجديد يتم اضافته للمعدل		
الفصلي التالي.		
هو تقدير مقرر سبق دراسته والنجاح فيه بتقدير اقل من (+B)، ويحق للطالب	تحسين	RT
التحسين في خمس مقررات بحد أقصي ١٥ ساعة معتمدة. للاستفادة من سياسة		
التحسين يجب علي الطالب عدم الحصول على التقدير راسب أو محروم في التقدير		
الجديد.		
هو تقدير مقرر رسب فيه الطالب ويجب عليه اعادته ولا يحق له الحصول على تقدير	اعادة	RP
أعلي من (B) عند النجاح فيه.		
هو تقدير مقرر ليس له ساعا <mark>ت م</mark> عتمدة ويتطلب نجاح أو رسوب فقط دون الإ <mark>ضافة</mark>	بدون ساعات	NC
للمعدل التراكمي.	معتمدة	
هو تقدير مقرر في نهاية فصل دراسي يتم استكماله في فصل دراسي تالي. التقدير النهائي	مكمل	IP
يتم اضافته للطالب عند الانتهاء من كل متطلبات المقرر.		
هو تقدير مقرر يتم السماح فيه للطالب بالحضور كمستمع. وعند انتهاء فترة التسجيل	مستمع	AU
والحذف والإضافة لا يحق للطالب التحويل من مستمع الي منتظم. يحق للطالب		
التحويل من منتظم الي مستمع حتى نهاية فترة الانسحاب.		





جامعة بنها الاهلية (برامج كلية علوم الحاسب) الخطط الدراسية والمحتوى العلمي

Benha National University (BNU)

Faculty of Computer Science Programs

Study Plans and Courses Description

List of Faculty Computer Science Programs

#	Program Title		Total Credits	Page #
1	Artificial Intelligence and Machine Learning	AIM	136	20
2	Computational Linguistics	COL	136	39
3	Data Science	DAS	136	57
4	Software and Application Development	SAD	136	76
5	Virtual and Augmented Reality	VAR	136	98



Coding System of Courses

#	Program Title/Course Area	Code
1	General Courses (University Requirements)	GEN
2	General Engineering Courses	ENG
3	Basic Science and Mathematics Courses	BAS
4	Basic Computer Science	BCS
5	Artificial Intelligence and Machine Learning	AIM
6	Computational Linguistics	COL
7	Data Science	DAS
8	Software and Application Development	SAD
9	Virtual and Augmented Reality	VAR



Example: The course with **DAS101** code is the course number 01 at the 1st level of Data Science Program

Benha National University (BNU)

Humanities and Social Science Courses

(University Requirements)

A. List of University Requirements

LIST OF COURSES

Code	Course	CR	Lec	Tut	Lab	Pre-requisites		
(A) Mandatory Courses								
GEN201	Transparency & Human Rights	1	0	•	0			
GEN301	Current Social Issues in Egypt	1	0	0	0			
GEN401	Professional Ethics	2	1	2	0			
(B) Elective Courses								
(I) Languages Courses								
GEN000	English Language (A remedy course)	0	0	0	0			
GEN101	English Language	2	1	2	0			
GEN102	German Language	2	1	2	0			
GEN103	French Language	2	1	2	0			
(II) History & Arts Courses								
GEN104	History of Science, Engineering & Technology	2	2	0	0			
GEN105	History of Arts & Architecture	2	2	0	0			
GEN106	Music	2	1	2	0			
(II) Skills Courses								
GEN202	Communication & Presentation Skills	2	1	2	0			
GEN203	Research and Analysis Skills	2	1	2	0			
GEN204	Critical Thinking	2	1	2	0			
GEN205	Leadership	2	1	2	0			
(III) Business Administration & Entrepreneurship Courses								
GEN407	Entrepreneurship	2	1	2	0			
GEN303	Business Administration	2	1	2	0			
GEN304	Marketing	2	1	2	0			
(V) Information Technology (IT) Courses								
GEN107	Information Technology	2	1	0	3			
GEN305	Virtual & Augmented Reality	2	1	0	3			
GEN306	Databases	2	1	0	3			
(VI) Other Courses								
GEN402	Psychology	2	2	0	0			
GEN403	Ecology	2	2	0	0			
GEN404	Nanotechnology	2	2	0	0			
GEN405	Physiology	2	2	0	0			
GEN406	Sustainability	2	2	0	0			

Benha National University (BNU)

University Requirements

Courses Description


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UNIVERSITY REQUIREMENTS COURSES DESCRIPTION

GEN000	English Language (A remedy course)	0 (0,0,0)
This course	is dedicated for (below Intermediate level) students improve their Engli	ish language
knowledge	and skills.	

Prerequisites: ---.

GEN105

GEN101 English Language 2 (1,2,0) Characteristics of the English technical language, grammar review, effective sentences and their characteristics, identify some common mistakes in the writing of English technical sentence, paragraph construction, types of paragraphs, development of communication skills by reading and analysis of excerpts from technical writing in various engineering disciplines. Prerequisites: ---.

GEN102	German Lan	guage							2 (1,2,0)
This is German language beginner's course. The course provides the students with a good idea									
about the German language, and include typical themes, grammar and vocabulary fields.									
Prerequisites	:								

GEN103	French Lan	guage					2 (1,2,0)	
This is Fren	ch language	beginner's	course. Tl	ne cou	rse prov	ides the students with	a good idea	
about the French language, and include typical themes, grammar and vocabulary fields.								
Prerequisites	:							

GEN104	History of Science, Engineering & Technology	2 (2,0,0)							
The definition of science, technology and engineering. The development of civilizations and									
their relation	their relationship to human sciences (ancient Egyptian civilization, Roman and Greek								
civilization,	Mesopotamia, dark ages, industrial revolution). Different engineering	g disciplines							
and their ro	ble in society. The historical relationship between science and tech	nology. The							
relationship	between the development of engineering, the social and economic d	evelopment							
of the envir	onment, the challenges of globalization and the new economy. The cor	tribution of							
engineers ir	the new millennium, the issues of economic and industrial developme	ent in Egypt.							
Prerequisites	:								

0111100		= (=)=)=)
The course	describes the changes and development that occurred in archite	cture during
Middle Age	s in both Europe and Islamic world, by teaching the characteristics an	d features of
different are	chitectural styles that appeared at that time, and the factors that led	to them. The
course inclu	ides the study of Romanesque and Gothic architecture in Medieval Eu	rope, as well
as the orig	gins and development of Islamic architecture, with special focu	s on Islamic

History of Arts & Architecture

2 (2.0.0)

architecture of Egypt during its different periods (Caliphate, Umayyad, Abbasid, Tulunid, Fatimid, Ayyubid, Mamluk and Ottoman periods).

Prerequisites: ---.

GEN106

This course is designed to provide a thorough introduction to basic music reading and notational skills. The students will become familiar with the terms, symbols, and common practices that provide the foundation for the musical language. No previous musical knowledge is assumed.

Prerequisites: ---.

GEN107 Information Technology

Music

IT concepts and terminology, Computer hardware, operating systems, Computer networks, Internet, Computer graphics, Multimedia systems, Databases. Practical applications: Operating system (Microsoft Windows), Word processing (Microsoft Word), Spreadsheets (Microsoft Excel), Microsoft PowerPoint, Databases (Microsoft Access). Introduction to programming concepts, programming languages and their classification, logical design of programs and algorithms, structural programming and object-oriented programming.

Prerequisites: ---.

GEN201 Transparency & Human Rights

Human rights: general introduction, definition of human rights, characteristics and principles of human rights, general rules of the idea of human rights, historical development of the idea of human rights, types of human rights, individual rights, collective rights (people's rights), sources of human rights, legal system of rules of protection Human rights, human rights according to the Egyptian constitution in 2014, the duties and obligations of individuals in society. Definition of corruption, its causes, effects and characteristics, types of corruption and its causes, the impact of corruption on human rights and development, the impact of corruption on economic rights and sustainable development, criminal confrontation of corruption.

Prerequisites: ---.

GEN202 Communication & Presentation Skills

General introduction to communication, the importance of communication, types of communication, communication barriers, listening skills, attributes and methods of reading, verbal communication: speaking and writing skills, non-verbal communication, dialogue skills and strategies of persuasion, communication in the work environment, writing CVs, reports and official letters.

Prerequisites: ---.

2 (1,2,0)

2 (1,0,3)

1 (1,0,0)

2 (1,2,0)

GEN203 Research and Analysis Skills

Scientific thinking and its characteristics, definition of scientific research and its characteristics, steps of scientific research (selection of the subject of research, determine the problem of research and selection factors, determine the framework of research, determine the method of research, data analysis), types of scientific studies: exploratory studies, descriptive studies, experimental studies. Methods of scientific research: descriptive approach, social survey, content study, content analysis. Data collection tools: Metrics, observation, interview, questionnaire. Data presentation and analysis methods: Descriptive methods, deductive methods.

Prerequisites: ---.

GEN204 Critical Thinking

Theoretical concepts (memory, thinking, creativity), an introduction to the thinking skills, the nature of thinking (definition, characteristics, levels), types of thinking (creative, critical, scientific), cognitive thinking skills, meta-cognitive thinking skills, thinking measurement tools, strategies Used in the development of thinking skills, programs to teach thinking skills, methods of teaching thinking skills.

Prerequisites: ---.

GEN205 Leadership

The course provides the students with a basic introduction to leadership by focusing on what it means to be a good leader. Emphasis in the course is on the practice of leadership. The course will examine topics such as: understanding leadership; recognizing leadership traits; engaging people's strengths; understanding philosophy and styles; attending to tasks and relationships; developing leadership skills; creating a vision; establishing a constructive climate; listening to out-group members; handling conflict; addressing ethics in leadership and overcoming obstacles. Students will assess their leadership traits and skills to improve their own leadership performance.

Prerequisites: ---.

GEN205Leadership2 (1,2,0)The course provides the students with a basic introduction to leadership by focusing on what
it means to be a good leader. Emphasis in the course is on the practice of leadership. The
course will examine topics such as: understanding leadership; recognizing leadership traits;
engaging people's strengths; understanding philosophy and styles; attending to tasks and
relationships; developing leadership skills; creating a vision; establishing a constructive
climate; listening to out-group members; handling conflict; addressing ethics in leadership and
overcoming obstacles. Students will assess their leadership traits and skills to improve their
own leadership performance.

Prerequisites: ---.

2 (1,2,0)

2 (1,2,0)

2 (1,2,0)

GEN301 Current Social Issues in Egypt

Business Administration

The course provides the students with an overview of the current social issues in Egypt such as the Population explosion, water problems, climatic changes, desertification, pollution ... etc. Prerequisites: ---.

2 (1,2,0) This course provides a survey of the business world. Topics include the basic principles and practices of contemporary business. Upon completion, students should be able to demonstrate an understanding of business concepts as a foundation for studying other business subjects. The course covers the following topics: The Environment of Business; Business Ownership and Entrepreneurship; Management and Organization; Human Resources; Marketing; Finance and Investment.

Prerequisites: ---.

GEN303

GEN304 Marketing 2 (1,2,0) The purpose of this course is to teach students to identify the marketing mix components; explain the environmental factors which influence consumer and organizational decisionmaking processes; outline a marketing plan; and interpret marketing research data to forecast industry trends and meet customer demands

Prerequisites: ---.

GEN305 Virtual & Augmented Reality

This course presents an introduction to virtual and augmented reality technologies. The course will cover the history of the area, fundamental theory, interaction techniques, and specific application areas. Concepts from the contributing fields of computer vision, computer graphics and human computer interaction will be introduced in the context of virtual and augmented reality.

Prerequisites: ---.

GEN306 Databases

This course will provide an introductory look at database concepts, emphasizing the relational database model. The course will also illustrate concepts and application of the entity relationship diagram as well as the principles and application of normalization. Practice lab. Using Microsoft Access.

Prerequisites: ---.

GEN401 Professional Ethics

The course provides the background needed to discuss the core topics of professional ethics, with a focus on the ethical issues facing profession in the areas of their work in companies. The course includes the definition of the general elements of the ethics of the profession and the observance of the public interest and regulations, obligations to the community, the responsibilities, disclosure of violations.

Prerequisites: ---.

2 (1,0,3)

2 (1,2,0)

2 (1,2,0)

2 (1,0,3)

GEN402 Psychology

This course provides an introduction to the concepts, theories, and research behind the study of human thought, emotion, and behavior.

Prerequisites: ---.

GEN403 Ecology Ecology is the study of how organisms interact with each other and their environment at the population, community, and ecosystem levels. The goal of this course is familiarize the students with ecological theory and its applications.

Prerequisites: ---.

GEN404 Nanotechnology 2 (2,0,0) The aim of the course is to provide students with a basic understanding of how nanomaterials and nanotechnology can be used to develop new materials, products and methods for industrial applications.

Prerequisites: ---.

GEN405	Physiology								2 (2,0,0)
The genera	l aims of the	course	are t	o give	the	students	knowledge	of the	physiology and
anatomy of	their own boo	dy.							

Prerequisites: ---.

GEN406	Sustainabi	lity									2 (2,0,0)
This course	e provides	the	theor	etical	back	kgroui	nd for	the	discussion	and	analysis of
sustainabilit	sustainability issues. Students will recognize specific sustainability issues, such as sustainable								sustainable		
energy, as p	oart of a mo	re cor	nplex	challe	nge c	of dev	eloping	g susta	ainable socie	eties a	and systems,
and against the background of the general meaning and implications of the conception of											
sustainabilit	Ξy.										

Prerequisites: ---.

GEN407 Entrepreneurship

Concepts in Entrepreneurship, Entrepreneurship and Small Enterprises, Generating Ideas for Entrepreneurial Projects, University and Entrepreneurship Opportunities and Challenges, Marketing Plan, Operational Plan, Financial Plan, Business Plan Writing, Technological Environment of Entrepreneurship, External Business Environment of Entrepreneurial Projects, Support Programs for Leading Projects Egyptian Economy, Entrepreneurial Project Presentation Skills.

Prerequisites: ---.

2 (2,0,0)

2 (2,0,0)

2 (1,2,0)

Benha National University (BNU)

Mathematics, Basic Science, Basic Computing Sciences Courses

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B. List of Mathematics & Basic Sciences Courses

Code	Course	CR	Lec	Tut	Lab	Pre Req.
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS102
BAS209	Statistical Analysis	3	2	2	0	BAS201

C. List of Basic Computing Sciences Courses

Code	Course	CR	Lec	Tut	Lab	Pre Req.
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS104	Computer Programming with MATLAB	3	2	0	3	
BCS204	Fundamentals of Databases	3	2	0	3	BCS206
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206
BCS209	Computer Architecture	3	2	0	3	BCS207
BCS210	Operating Systems	3	2	0	3	BCS101
BCS311	Artificial Intelligence	3	2	0	3	BAS122, BAS201
BCS112	Technical Report Writing	3	2	2	0	-



BASIC SCIENCE & MATHEMATICS COURSES DESCRIPTION

BAS201 Probability and Statistical Methods

Descriptive statistics, Statistical classification of data, Measures of central tendency, Measures of dispersion, Probability theory, Independent and dependent events, Conditional probability, Bayes theorem, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Central limit theorem, Test of hypothesis.

Prerequisites: ---.

BAS203 Differential Equations

Functions of several variables, Partial differentiation, Maximum and minimum values, Conditional extrema, Curvature, Double and triple integrals, Line integral, Ordinary differential equations, first order and higher order, Linear Systems of ordinary differential equations, Vectors analysis, Gradient, Laplace transformations, Inverse Laplace transformations.

Prerequisites: BAS102.

BAS225 **Statistical Analysis**

This course prepares students to carry out descriptive and inferential statistical analyses. It covers statistical skills for advanced work in the functional areas of data science and analytics, including descriptive statistics, probability and its distributions, sampling, and estimation.

Prerequisites: BAS201

BAS120 Differential and Integral Calculus

This course covers pre-calculus review: sets and functions; limits and continuity – derivatives: techniques of differentiation; derivatives of the basic and fundamental functions; implicit differentiation; linear approximation and differentials; extreme of functions; optimization problems; velocity and acceleration – integrals: indefinite integrals; change of variables; definite integrals; the fundamental theorem of calculus – techniques of integration: integration by parts; trigonometric integrals and substitutions; integrals of rational functions – numerical integration – applications of definite integrals.

Prerequisites: non.

BAS121	Physics	3 (2,0,3)					
This course	covers vector analysis; coulombs law and electric field intensity, electric	flux density,					
gauss law	and divergence; energy and potential; conductors, dielectrics, and (capacitance;					
experiment	experimental mapping methods; Poisson and Laplace equations. steady magnetic field, magnetic						
forces, mate	erials, and inductance; time varying fields, and Maxwell's equations; the ur	niform plane					
wave; the la	ws of circuit theory.						

Prerequisites: non.

BAS122	Discrete Mathematics	3 (2,2,0)

3 (2,2,0)

3 (2,2,0)

3 (2,2,0)

3 (2,2,0)

This course provides students a solid background on discrete mathematics and structures pertinent to computer science. Topics include logic; set theory; mathematical reasoning; counting techniques; discrete probability; trees, graphs, and related algorithms; modeling computation. Subjects may include proof by induction, introduction to graph theory, recurrences, sets, functions, and an introduction to program correctness.

Prerequisites: non

BAS123	Linear Algebra	3 (2,2,0)							
This course covers matrix theory and linear algebra. Topics covered include systems of linear									
equations, r	equations, matrix algebra, vector spaces, linear independence, dimension, linear transformations,								
eigenvector	s and eigenvalues, inner products and orthogonality and projections	s, and their							
applications	j.								

Prerequisites: non

BAS124 Electronics 3 (2,0,3) This course teaches classical switching theory including Boolean algebra, logic minimization, algorithmic state machine abstractions, and synchronous system design. This theory is then applied to digital electronic design. Techniques of logic implementation, from Small Scale Integration (SSI) through Application-Specific Integrated Circuits (ASICs), are encountered. Topics covered may include: electrical circuit laws and theorems: Ohm's Kirchhoff's, mesh, nodal, Thevenin's maximum power transfer theorems for both DC and AC circuits, R, L, C elements. Electronic components and circuits diodes – bipolar junction transistors – field-effect transistors and use of transistors in amplifiers. OP-Amp, digital circuits – PHical design of simple gates – flipflops and memory circuits.

Prerequisites:

BAS201 Probability and Statistical Methods

Descriptive statistics, Statistical classification of data, Measures of central tendency, Measures of dispersion, Probability theory, Independent and dependent events, Conditional probability, Bayes theorem, Random variable, Probability density function, Discrete probability distributions, Continuous probability distributions, Central limit theorem, Test of hypothesis.

Prerequisites: ---.

3 (2,2,0)

BASIC COMPUTING SCIENCES COURSES DESCRIPTION

The course presents a broad overview of Computer Science to provide students with an appreciation for and an understanding of the many different aspects of Computer Science. A comprehensive and rigorous exploration of computing is undertaken to lay a solid foundation to support further study. Topics include: Computers and Digital Basics, Numbering systems, Computer Hardware, Computer Software, Operating Systems and File Management, Local Area Networks, Digital Media, The Computer Industry: History, Careers, and Ethics, Information Systems Analysis and Design, Databases, Computer Programming, The Internet, and The Web and E-mail, Artificial intelligence.

Prerequisites: non

BCS102 Structured Programming

The course presents the fundamental concepts of structured programming and algorithmic problem solving: primitive data types, control structures, functions and parameter passing, topdown design, arrays, files, and the mechanics of compiling, running, testing, and debugging programs.

Prerequisites: non.

BCS103 Object Oriented Programming

The course presents the principles of object-oriented program design and advanced algorithmic problem solving illustrated through an object-oriented language. Topics include encapsulation and information hiding; classes, subclasses, and inheritance; polymorphism; class hierarchies, and the creation, implementation, and reuse of APIs (application programming interfaces). Prerequisites: BCS102.

BCS104 Computer Programming with MATLAB

The aims of this course are to introduce the elements and practicalities of computer programming through the MATLAB mathematical computing environment. The students will develop the skills to implement software solutions to a wide range of engineering problems. Topics include MATLAB interface and basic commands, pseudocode, Variable creation, operators, user input and output, Flow control: if statements, switch statements, While loops, For loops, Vectors (arrays), matrices, strings, Algorithms implementation, plotting, Image manipulation, Scripts and functions. Prerequisites: non.

BCS204 **Fundamentals of Databases**

Topics covered may include: Concepts and methods in database systems, File organization and retrieval, Data manipulation, Query formulation and language, Database models, Data description languages, database integrity and security, Data dictionary/directory systems, database

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

administration, Database design, Survey of some existing database management systems, some applications using commercial languages.

Prerequisites: BCS206.

BCS105 Computer Networks Fundamentals 3 (2,0,3) Topics include: Architecture and protocols of computer networks. Protocol layers; network topology; data-communication principles, including circuit switching, packet switching and error control techniques; sliding window protocols, protocol analysis and verification; routing and flow control; local and wide area networks; network interconnection; client-server interaction; emerging networking trends and technologies; topics in security and privacy. Prerequisites: BCS101.

BCS206 Data Structures 3 (2,0,3) A study of data structures and algorithms for their manipulation; analyzing basic data structure operations. The course introduces and develops methods for designing and implementing abstract data types and structures. Topics include: arrays, stacks, queues, lists, doubly-linked lists, trees, dynamic storage allocation, graphs.

Prerequisites: BCS102.

3 (2,0,3) Topics include: Digital logic, Boolean algebra, De-Morgan's law, logic gates and their truth tables, canonical forms, Combinational logic circuits, minimization techniques, Arithmetic and data handling logic circuits, decoders and encoders, Multiplexers and demultiplexers, Combinational Circuit design, Flip-flops, race around problems, Counters and their applications, PLA design, Synchronous and asynchronous logic design: state diagram, Mealy and Moore machines, State minimizations and assignments, Pulse mode logic, Fundamental mode design.

Prerequisites: BAS124.

BCS208 Topics covered may include: Techniques for analysis of algorithms: asymptotic notation (Big-Oh, little-oh, and Theta) for estimating the complexity of a problem, using recurrence relations to analyze the complexity of recursive algorithms, searching, sorting, and depth- and breadth-first search in graphs, Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound, Basic search and traversal techniques, graph algorithms, Algebraic simplification and transformations, lower bound theory, NP-hard and NP-complete problems.

Prerequisites: BCS206.

BCS209 **Computer Architecture**

The architecture and organization of a simple computer system is studied. Topics covered include information representation and transfer, instruction and data access methods, the control unit: hardwired and microprogrammed, memory organization, I/O systems, channels, interrupts, DMA, Von Neumann SISD organization, RISC and CISC machines. Pipelined machines, interleaved

BCS207

Logic design

Design and Analysis of Algorithms

3 (2,0,3)

memory system, caches, Hardware and architectural issues of parallel machines, Array processors, associative processors, multiprocessors, systolic processors, data flow computers and interconnection networks, High level language concept of computer architecture.

Prerequisites: BCS207.

BCS210 Operating systems

Topics include: Principles of operating systems, design objectives, sequential processes, concurrent processes, concurrency, functional mutual exclusion, processor cooperation and deadlocks, processor management, Control and scheduling of large information processing systems, Resource allocation, dispatching, processor access methods, job control languages, Memory management, memory addressing, paging and store multiplexing, Multiprocessing and time sharing, batch processing, Scheduling algorithms, file systems, protection and security, design and implementation methodology, performance evaluation and case studies.

Prerequisites: BCS101.

BCS311 Artificial Intelligence

Topics covered may include: Survey and concepts in Artificial Intelligence, Problem solving agents, Uninformed and Informed search techniques, Game playing, Knowledge representation, Inference in Propositional and First Order logic, Theorem Proving, Decision tree learning, Neural Network, Bayesian learning, planning.

Prerequisites: BAS122 +BAS201

BCS112 Technical Report Writing

A brief overview of the field of technical writing, including techniques and strategies of effective writing, and of conventions used in documents such as letters, memos, proposals, abstracts and reports. Topics may include: general principles of good writing, design and usability, documentation development process, writing procedures, aspects of the language, obstacles to readability, and writing reports. Assignments include: cover letter and resume for job application, statement of purpose for graduate school application, algorithm description and analysis, user documentation, proposal preparation, critical analysis of published papers, survey of the literature, term paper, and oral presentations.

Prerequisites: ---.

DAS213 Fundamentals of Data Science

In this course students build a foundation for doing data science, machine learning, and artificial intelligence (AI). The course employs a combination of theory and hands-on experience using Python programming tools. The focus is on the foundational computational statistical analysis and visualization methods underpinning modern data science, machine learning, and AI. The hands-on component of the course uses the Python packages NumPy, pandas, seaborn, statsmodels, and PyMC3, along with selected other open source packages. This course provides an introduction to

3 (2,2,0)

3 (2,0,3)

3 (2,0,3)

the basic concepts of data science; presents effective methods of data visualization and summary statistics to explore complex data; and reviews probability theory, with an emphasis on conditional probability as a foundation of modern computational statistical methods and AI. The course covers basic computational statistical inference employing three approaches: maximum likelihood frequentist, bootstrap frequentist, and Bayesian. There is an overview of the properties and behavior of the rich family of linear models, which are foundational to many machine learning and AI algorithms, and a focus on applying Bayesian models and inference to real-world problems. We explore models for time series data and (time permitting) spatial data.

Prerequisites: BAS201.



برنامج الذكاء الصناعي وتعلم الآلة ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ENGINEERING PROGRAM (AIM)



Artificial Intelligence and Machine Learning Engineering (AIM) PROGRAM

MISSION

Provide high quality undergraduate education that will prepare graduates for successful careers in artificial intelligence and machine learning fields to support the local, regional, and international needs within the framework of human and moral values.

MAIN GOALS

The artificial intelligence & machine learning program is designed to qualify students for a successful professional career in the fields of computer science, artificial intelligence, and machine learning. This is based on a solid foundation in technical and managerial abilities, professional skills and contemporary communication skills, mastering the techniques of integrated processes. The program also aims to provide students with the skills to deal with developments in modern technologies and gain competitive advantages. This is to prepare graduates at the high professional level to meet the technical and social challenges of the future and to continue their studies at the postgraduate level. To achieve this task, the objectives of the artificial intelligence and machine learning program can be summarized as follows:

- 1. Providing students with the ability to apply knowledge in mathematics and basic sciences to model problems related to artificial intelligence and machine learning.
- 2. Providing students with a solid background in the fields of computer science, artificial Intelligence, and machine learning.
- 3. Enabling students to integrate various analysis and design methodologies, models, techniques, and tools to develop intelligent computer systems.
- 4. Prepare students to cope with the ever-evolving disciplines of artificial intelligence and machine learning technologies.
- 5. Providing students with the communication skills and responsible teamwork, establish professional attitudes and ethics, so that graduates are prepared for a complex modern work environment and lifelong learning.

DNU

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ENGINEERING PROGRAM COURSES CLASSIFICATION AND PERCENTAGES

#	Subject Area	CR	%
А	Univ. Requirements (Humanities and Social Sciences)	12	8.82%
В	Mathematics & basic Sciences	24	17.65%
C	Basic Computing Sciences (Institution Requirements)	36	26.47%
D	Applied Computing Sciences (specialization)	51	37.5%
E	Training	6	4.41%
F	Projects	7	5.15%
		136	100



ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ENGINEERING PROGRAM LIST OF COURSES

Code	Course	CR	Lec	Tut	Lab	Pre Req.
	(A) Humanities & Social Science (Univ.	Req.) (12 Crea	dits)		
GEN000	English Language (A remedy course)	0	0	0	0	
GEN201	Transparency & Human Rights	1	1	•	0	
GEN301	Current Social Issues in Egypt	1	1	0	0	
GEN401	Professional Ethics	2	1	2	0	
GEN10X	Elective (1) From Language Courses List	2	1	2	0	
GEN104	History of Science, Engineering & Technology	2	2	0	0	
GEN202	Communication & Presentation Skills	2	1	0	3	
GEN407	Entrepreneurship	2	1	2	0	
	(B) Mathematics & basic Science Cou	rses (2	4 Credi	ts)		
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS120
BAS209	Statistical Analysis	3	2	2	0	BAS201
	(C) Basic Computing Sciences (Institution Require	ements) cours	es (36 (Credits	;)
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS204	Fundamentals of Databases	3	2	0	3	BCS206
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206
BCS209	Computer Architecture	3	2	0	3	BCS207
BCS210	Operating Systems	3	2	0	3	BCS101
BCS311	Artificial Intelligence	3	2	0	3	BAS122, BAS201
BCS112	Technical Report Writing	3	2	2	0	-

(D) Applied Computing Sciences (specialization) courses (51 Credits)						
AIM301	Software Engineering	3	2	0	3	BCS103
AIM302	Microprocessors and Assembly Language	3	2	0	3	BCS209
AIM303	Systems Analysis and Design	3	2	0	3	-
AIM304	Machine Learning	3	2	0	3	BCS311, BAS201

AIM305	Knowledge Representation & Reasoning 1	3	2	0	3	BCS311	
AIM306	Robotics	3	2	0	3	BAS123	
AIM307	Neural Networks	3	2	0	3	BCS103	
AIM308	Natural Language Processing	3	2	0	3	BCS311	
AIM309	Image Processing	3	2	0	3	BAS123	
AIM401	Deep Learning	3	2	0	3	AIM307	
AIM402	Computer Vision	3	2	0	3	AIM309	
AIM403	Data Science	3	2	0	3	AIM304	
AIM4xx	Elective (2) (AI and ML Elective Courses List)	3	х	х	х	ххх	
AIM4xx	Elective (3) (AI and ML Elective Courses List)	3	х	х	х	ххх	
AIM4xx	Elective (4) (AI and ML Elective Courses List)	3	х	х	х	ххх	
AIM4xx	Elective (5) (AI and ML Elective Courses List)	3	х	х	х	ххх	
AIM4xx	Elective (6) (AI and ML Elective Courses List)	3	х	х	х	ххх	
	(E) Training (6 Credits)					
AIM230	Field Training (I)	3	0	0	6	60 Credits	
AIM340	Field Training (II)	3	0	0	6	90 Credits	
(F) Projects (7 Credits)							
AIM440	Graduation Project (1)	3	0	6	0	100 Credits	
AIM450	Graduation Project (2)	4	0	8	0	AIM440	
	Elective Courses for Artificial Intelligence a	nd Ma	chine L	.earning	5		
AIM411	Elective Courses for Artificial Intelligence a Natural Language Understanding	nd Ma 2	<mark>chine L</mark> 2	earning	3	AIM308	
AIM411 AIM412	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision	nd Ma 2 2	<mark>chine L</mark> 2 2	earning 0 0	3 3	AIM308 AIM402	
AIM411 AIM412 AIM413	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics	nd Ma 2 2 2	chine L 2 2 2	earning 0 0 0	3 3 3	AIM308 AIM402 AIM306	
AIM411 AIM412 AIM413 AIM414	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics	nd Ma 2 2 2 2 2	chine L 2 2 2 2 2	earning 0 0 0 0	3 3 3 3 3	AIM308 AIM402 AIM306 AIM306	
AIM411 AIM412 AIM413 AIM414 AIM415	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing	nd Ma 2 2 2 2 2 2 2 2	chine L 2 2 2 2 2 2 2 2 2 2 2	earning 0 0 0 0 0	3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM416	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition	nd Ma 2 2 2 2 2 2 2 2 2 2	chine L 2 2 2 2 2 2 2 2 2 2 2 2 2 2	earning 0 0 0 0 0 0	3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304, AIM307	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM416 AIM417	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence	nd Ma 2 2 2 2 2 2 2 2 2 2 2 3	chine L 2	earning 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304, AIM307 BCS311	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning	nd Ma 2 2 2 2 2 2 2 2 2 2 3 3 3	chine L 2	earning 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304, AIM307 BCS311 AIM401	
AIM411 AIM412 AIM413 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things	nd Ma 2 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3	chine L 2	earning 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304, AIM307 BCS311 AIM401 AIM306	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419 AIM420	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning	nd Ma 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3	chine L 2	earning 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304, AIM307 BCS311 AIM401 AIM306 AIM401	
AIM411 AIM412 AIM413 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419 AIM420 AIM421	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning Big Data Analysis	nd Ma 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3	chine L 2	earning 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304, AIM307 BCS311 AIM401 AIM306 AIM401 BCS204	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419 AIM420 AIM421 AIM422	Elective Courses for Artificial Intelligence at Natural Language Understanding Advanced Computer Vision Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning Big Data Analysis Data Mining Data Mining	nd Ma 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3	chine L 2	earning 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304, AIM307 BCS311 AIM401 AIM306 AIM401 BCS204 BCS102	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419 AIM420 AIM421 AIM422 AIM423	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning Big Data Analysis Data Mining Special Topics in Advanced Machine Learning	nd Ma 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3	chine L 2 2 2 2 <td>earning 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td>3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3</td> <td>AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM306 AIM401 BCS204 BCS102 AIM304</td>	earning 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM306 AIM401 BCS204 BCS102 AIM304	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419 AIM420 AIM421 AIM422 AIM423 AIM423	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning Big Data Analysis Data Mining Special Topics in Advanced Machine Learning	nd Ma 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3	chine L 2	earning 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM306 AIM401 BCS204 BCS102 AIM304 AIM401	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419 AIM420 AIM420 AIM421 AIM422 AIM422 AIM425	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning Big Data Analysis Data Mining Special Topics in Advanced Machine Learning Advanced Deep Learning	Nd 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	chine L 2	earning 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM401 BCS204 BCS102 AIM304 AIM401 AIM304	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM418 AIM419 AIM420 AIM420 AIM421 AIM422 AIM422 AIM425 AIM425 AIM426	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning Big Data Analysis Data Mining Special Topics in Advanced Machine Learning Advanced Deep Learning Analysis of Time Series Data Stochastic Processes	nd Ma 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3	chine L 2 2 2 2 <td>earning 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td>3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3</td> <td>AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM306 AIM401 BCS204 BCS102 AIM304 AIM401 AIM304 BAS201</td>	earning 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM306 AIM401 BCS204 BCS102 AIM304 AIM401 AIM304 BAS201	
AIM411 AIM412 AIM413 AIM414 AIM415 AIM415 AIM416 AIM417 AIM416 AIM417 AIM418 AIM419 AIM420 AIM420 AIM421 AIM422 AIM422 AIM425 AIM425 AIM427	Elective Courses for Artificial Intelligence a Natural Language Understanding Advanced Computer Vision Robot Kinematics and Dynamics Planning Techniques for Robotics Speech Processing Pattern Recognition Special Topics in Advanced Artificial Intelligence Deep Reinforcement Learning Internet of Things Natural Language Processing with Deep Learning Big Data Analysis Data Mining Special Topics in Advanced Machine Learning Advanced Deep Learning Knowledge Representation & Reasoning 2	Nd 2 2 2 2 2 2 3	chine L 2 </td <td>earning 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td>3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3</td> <td>AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM401 BCS204 BCS102 AIM304 AIM401 AIM304 BAS201 AIM305</td>	earning 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	AIM308 AIM402 AIM306 AIM306 AIM304,AIM307 AIM304,AIM307 BCS311 AIM401 AIM401 BCS204 BCS102 AIM304 AIM401 AIM304 BAS201 AIM305	

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ENGINEERING (AIM) PROGRAM Study Plan

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1st Level

			Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN104	History of Science, Engineering & Technology	2	2	0	0	-
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
		17	12	4	9	

FIRST SEMESTER

SECOND SEMESTER

	Cre		Contact Hours				
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
GEN10X	Elective (1) From Language Courses List	2	1	2	0		
BAS123	Linear Algebra	3	2	2	0	-	
BAS124	Electronics	3	2	0	3	-	
BCS103	Object Oriented Programming	3	2	0	3	BCS102	
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101	
BCS112	Technical Report Writing	3	2	2	0	-	
		17	11	6	9		

2nd Level

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN202	Communication & Presentation Skills	2	1	0	3	
GEN201	Transparency & Human Rights	1	0	•	0	
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS120
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
		15	9	4	9	

FIRST SEMESTER

SECOND SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
BAS225	Statistical Analysis	3	2	2	0	BAS201
BCS204	Fundamentals of Databases	3	2	0	3	BCS206
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206
BCS209	Computer Architecture	3	2	0	3	BCS207
BCS210	Operating Systems	3	2	0	3	BCS101
		15	10	2	12	

SUMMER SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
AIM230	Field Training (I)	3	0	0	6	60 Credits

3rd Level

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN301	Current Social Issues in Egypt	1	1	0	0	
BCS311	Artificial Intelligence	3	2	0	3	BAS122, BAS201
AIM301	Software Engineering	3	2	0	3	BCS103
AIM302	Microprocessors and Assembly Language	3	2	0	3	BCS209
AIM303	Systems Analysis and Design	3	2	0	3	
AIM305	Knowledge Representation & Reasoning 1	3	2	0	3	BCS311
		16	11	0	15	

FIRST SEMESTER

SECOND SEMESTER

	Cre		Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
AIM304	Machine Learning	3	2	0	3	BCS311, BAS201
AIM306	Robotics	3	2	0	3	BAS123
AIM307	Neural Networks	3	2	0	3	BCS103
AIM308	Natural Language Processing	3	2	0	3	BCS311
AIM309	Image Processing	3	2	0	3	BAS123
		15	10	0	15	

SUMMER SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
AIM340	Field Training (II)	3	0	0	6	90 Credits

4th Level

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN401	Professional Ethics	2	1	2	0	
AIM401	Deep Learning	3	2	0	3	AIM307
AIM402	Computer Vision	3	2	0	3	AIM309
AIM4xx	Elective (2) (AI & ML Elective Courses List)	3	2	0	3	
AIM4xx	Elective (3) (AI & ML Elective Courses List)	3	2	0	3	
AIM440	Graduation Project (1)	3	0	6	0	100 Credits
		17	9	8	12	

FIRST SEMESTER

SECOND SEMESTER

			Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN407	Entrepreneurship	2	1	2	0	
AIM403	Data Science	3	2	0	3	AIM304
AIM4xx	Elective (4) (AI & ML Elective Courses List)	3	2	0	3	
AIM4xx	Elective (5) (AI & ML Elective Courses List)	3	2	0	3	
AIM4xx	Elective (6) (AI & ML Elective Courses List)	3	2	0	3	
AIM450	Graduation Project (2)	4	0	8	0	AIM440
		18	9	10	12	

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING PROGRAM (AIM) COURSE DESCRIPTIONS

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ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING PROGRAM **COURSE DESCRIPTIONS**

AIM301 Software Engineering This course is designed to provide the student with principles and techniques for the design and construction of reliable, maintainable, and useful software systems. Software life cycle, requirements specifications, and verification and validation issues. Implementation strategies (e.g., top-down, bottom-up, teams), support for reuse, and performance improvement. Topics covered may also include: concepts of software engineering: requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance, Software support tools, Software project organization, quality assurance, management and communication skills.

Prerequisites: BCS103.

AIM302 **Microprocessors and Assembly Language**

This course introduces microprocessors, instruction set of microprocessors, assembly language programming and machine language concepts. Internal communication structure, memory interface components, Input Output processors, Direct Memory Access technique are discussed. The role of interrupts and interrupt handling techniques are also introduced. The students are given training in developing assembly language programs for simple problems during the theoretical and practical sessions.

Prerequisites: BCS209

AIM303 **Systems Analysis and Design**

Evaluation, selection, and organization of technical projects. Concepts of the network-based project management methodology. Network development. Project planning, scheduling, and control. Project cost management. Resource constrained projects. A case study approach is adopted during the course. Commercial software packages will be used throughout the course. The course will also introduce some contemporary project management subjects such as: eprojects, and Intelligent project management.

Prerequisites:.

AIM304 **Machine Learning**

This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Prerequisites: BCS311, BAS201.

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

and transform techniques for image processing including two dimensional Fourier transforms,

AIM305 Knowledge Representation & Reasoning 1

The course introduces the principles of logic-based knowledge representation and reasoning, as well as other important symbolic approaches to representing and reasoning about knowledge such as production systems, frames, taxonomies and Kripke models. How to represent different sorts of knowledge, such as uncertain or incomplete knowledge, knowledge about action and change, and knowledge about default situations, is discussed. Various types of reasoning are discussed, such as logical entailment, explanation and planning. Topics may include: Representing knowledge using logic. Fundamental trade-off between representation power and computational properties. Fragments of first order logic suited for Knowledge Representation. Reasoning algorithms and implementations, and how reasoning is used to support knowledge representation. Ontology languages for the Semantic Web. Non-monotonic logics.

Prerequisites: BCS311.

AIM306 Robotics 3 (2,0,3) The purpose of this course is to introduce you to basics of modeling, design, planning, and control of robot systems. In essence, the material treated in this course is a brief survey of relevant results from geometry, kinematics, statics, dynamics, and control.

Prerequisites: BAS123.

AIM307 **Neural Network** The course will explain both the classical and the new techniques of neural networks in supervised, unsupervised and reinforcement learning schemes. Particularly, a single perceptron and neurons, feed-forward neural networks, Kohonen's maps, associative memories, Hopfield's and many other recurrent networks will be considered. Primary and advanced examples of the presented neural techniques will give the student skills and understanding required to apply these techniques in many engineering applications.

Prerequisites: BCS103.

AIM308 **Natural Language Processing** 3 (2,0,3) The course aims to familiarize students with recent research across a range of topics within NLP, mainly within the framework of neural network models, and with a focus on applications such as machine translation, summarization, and semantic parsing. As an MSc-level course that assumes previous experience with NLP, it will discuss a range of different issues, including linguistic/representational capacity, computational efficiency, optimization, etc. There is no textbook for the course; readings will come from recent research literature.

Prerequisites: BCS311.

AIM309 **Image Processing** This course is an introduction to image processing and image analysis techniques and concepts. enhancement including contrast manipulation, histogram equalization, edge highlighting; Filtering

Areas examined include: Imaging sensors and their principles; Image representation and storage, coding and compression techniques, lossy versus lossless; Techniques for noise reduction. Image

3 (2,0,3)

4 (3,0,3)

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AIM230 Field Training (I) 3 (0,0,6) The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training

The design process will continue from the preliminary phase to the completion of a conceptual design of the project. The students, working in teams, will prepare requirements, design, implementations of the project. A list and general description of the many details and other

miscellaneous activities required to complete the project will also be prepared.

This course requires the students, working in teams, to take an actual project from the initial proposal stage through the preliminary design phase. Students will conduct the necessary activities and prepare the various documents needed to complete the preliminary design. Prerequisites: 100 Credits AIM450 **Graduation Project (2)**

Prerequisites: AIM440.

AIM401

AIM402

AIM440

Prerequisites: AIM307.

This course introduces computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, Multiview geometry including stereo, motion estimation and tracking, and classification. Students will develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment (e.g. panoramas), tracking, and action recognition. Prerequisites: AIM309.

embedding, Recurrent Neural Networks (RNN), vanishing gradient problem, case studies: object detection, and stock price estimation, GANs.

Computer Vision

Graduation Project (1)

Deep Learning

Prerequisites: BAS123.

wavelets and convolution; Spatial transformations and image registration. Segmentation and thresholding techniques; Applications of morphology to image processing including erosion, dilation and hit-or-miss operations for binary and grey scale images; Image feature estimation such as edges, lines, corners, texture and simple shape measures. Object classification, template matching techniques and basic image based tracking will also be examined.

3 (2,0,3)

4 (0,8,0)

Convolutional Neural Network (CNN), pooling layers, CNN applications, Autoencoders, Manifold

3 (2.0.3)

3 (0,6,0)

supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions. Prerequisites: 60 Credits.

AIM340 Field Training (II) The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

Prerequisites: 90 Credits.

AIM411 Natural Language Understanding 2 (2,0,3) The intersection of human languages and computer science. How can computers acquire, comprehend and produce English? Language computational methods, translate from language into another, filter junk email, extract social networks from the web, and find the main topics in the day's news. how linguists explain language phenomena, including automatic discovery of different word senses and phrase structure. statistical and probabilistic methods; robust approaches to parameter estimation and inference.

Prerequisites: AIM308.

AIM412 **Advanced Computer Vision**

Explore image classification, image segmentation, object localization, and object detection. Apply transfer learning to object localization and detection. advanced object detection models such as regional-CNN and ResNet-50, Implement image segmentation using variations of the fully convolutional network (FCN), predictions using class activation maps and saliency maps. Prerequisites: AIM402.

AIM413 **Robot Kinematics and Dynamics** This course focuses on the kinematics, dynamics, and programming of robotic mechanisms. It explores control, sensor and effector design, and automatic planning methods. The fundamental techniques apply to robotic arms, mobile robots, active sensor platforms, and other computercontrolled kinematic linkages. Arms are the primary application, and we will do some lab exercises to program KUKA robot arms and bases to perform interesting tasks.

Prerequisites: AIM306.

AIM414 **Planning Techniques for Robotics**

Planning is one of the core components that enable robots to be autonomous. Robot planning is responsible for deciding in real-time what the robot should do next, how to do it, where the robot should move next and how to move there. This class does an in-depth study of popular planning techniques in robotics and examines their use in ground and aerial robots, humanoids, mobile

2 (2,0,3)

3 (0,0,6)

2 (2,0,3)

manipulation platforms and multi-robot systems. The students learn the theory of these methods and implement them in a series of programming-based projects.

Prerequisites: AIM306.

AIM415	Speech Processing	2 (2,0,3)				
This course	This course offers an in-depth introduction to automatic speech recognition (ASR), the problem of					
automatical	ly extracting text from human speech. This class will cover many the	oretical and				
practical as	pects of machine learning techniques that are employed in large-scale A	SR systems.				
Apart from teaching classical algorithms that form the basis of statistical speech recognition, this						
class will also cover the latest deep learning techniques that have made important advances in						
achieving st	ate-of-the-art results for speech recognition.					

Prerequisites: AIM304 and AIM307.

AIM416 Pattern Recognition

Pattern recognition techniques are concerned with the theory and algorithms of putting abstract objects, e.g., measurements made on physical objects, into categories. Typically, the categories are assumed to be known in advance, although there are techniques to learn the categories (clustering). Methods of pattern recognition are useful in many applications such as information retrieval, data mining, document image analysis and recognition, computational linguistics, forensics, biometrics and bioinformatics. Much of the topics concern statistical classification methods. They include generative methods such as those based on Bayes decision theory and related techniques of parameter estimation and density estimation. Next come discriminative methods such as nearest-neighbor classification, support vector machines. Artificial neural networks, classifier combination and clustering are other major components of pattern recognition.

Prerequisites: AIM304 and AIM307.

AIM417	A417 Special Topics in Advanced Artificial Intelligence				
The course	cover in depth on selected topics and methods within artificial inte	lligence ar			

applications. Content can include computational intelligence algorithms in search, optimization and classification, which to a large extent consist of mechanisms. Applications include robotics, vision, health and medicine. The course syllabus will continuously be updated with methods from state-of-the-art research.

Prerequisites: BCS311.

AIM418 Deep Reinforcement Learning

Learn advanced deep reinforcement learning algorithms—from Deep Q-Networks (DQN) to Deep Deterministic Policy Gradients (DDPG). Apply these concepts to train agents to walk, drive, or perform other complex tasks, and build deep reinforcement learning projects.

Prerequisites: AIM401.

AIM419	Internet of Things	2 (2,0,3)

3 (2,2,0)

Development of Internet of Things (IoT) products and services including devices that are connected to the Internet", requires the understanding of embedded electronics, software, sensors, network, and data analytics. course will introduce a wide range of topics in the broad areas of IoT and provide hands-on experiences via a series of exciting projects.

Prerequisites: AIM306.

AIM420 Natural Language Processing with Deep Learning 2 (2,0,3) Deep learning approaches for different NLP tasks, Applications of NLP such as web search, advertising, emails, customer service, language translation, virtual agents, medical reports, etc., End-to-end neural models that do not require traditional, task-specific feature engineering. In this course, students will gain a thorough introduction to cutting-edge research in Deep Learning for NLP.

Prerequisites: AIM401.

AIM421 **Big Data Analysis** 2 (2,0,3) Understand big data, the tools and systems used by big data scientists and engineers, analyses of big data. Tools such as Hadoop with MapReduce, Spark, Pig and Hive. Predictive modeling and leverage graph analytics to model problems. Exploration of large, complex datasets. Prerequisites: BCS204.

AIM422 **Data Mining** Knowledge discovery in databases, data mining process, data cleaning and preparation, mining association rules, classification, prediction, clustering, web mining, applications of data mining, mining advanced databases. Data mining tools.

Prerequisites: BCS102.

Alivi4Z3	Special Topics in Adva	anced Machine L	earning		Z (Z,U,3)
The course	cover in depth on s	selected topics a	and methods	within machine	learning and
applications.	Content can include	computational in	ntelligence alg	orithms in search	, optimization
and classifica	tion, which to a large	e extent consist c	of mechanisms	. Applications inc	lude robotics,
vision, health	and medicine. The co	burse syllabus wil	l continuously	be updated with i	methods from
state-of-the-a	art research.				

Prerequisites: AIM304.

AIM424 Advanced Deep Learning

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The course cover in depth on selected topics and methods within machine learning and applications. Content can include computational intelligence algorithms in search, optimization and classification, which to a large extent consist of mechanisms. Applications include robotics, vision, health and medicine. The course syllabus will continuously be updated with methods from state-of-the-art research.

Prerequisites: AIM401.

AIM425	Analysis of Time Series Data	3 (2,0,3)

2 (2,0,3)

2/2 2 2

This course deals with the problems of modelling and forecasting time series data. Computer program packages are used as an aid for obtaining solutions. Topics include serial correlation, seasonal adjustments, exponential smoothing and extrapolation, state space models, moving average, autoregressive, ARMA and ARIMA models, and nonlinear time series, including ARCH models and chaos. Emphasis on model building, diagnostic checking, and model selection. Prerequisites: AIM304.

AIM426 Stochastic Processes

Introduction to stochastic process, discrete time Markov chain, Poisson process, Compound Poisson Processes and Renewal Processes, continuous-time Markov Chain, Transition probabilities and limiting behavior for Markov Chains, Martingales, Brownian Motion, applications in finance and insurance.

Prerequisites: BAS201.

AIM427 Knowledge Representation & Reasoning 2

A second course in knowledge representation and reasoning covering such topics as automated theorem proving, semantic network implementation, modal and epistemic logics, ontologies, semantic networks, production systems, frames, description logics, inheritance networks, default reasoning, and the situation calculus.

Prerequisites: AIM305.

AIM428 Embedded Systems

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

Embedded (or reactive) systems monitor, respond to, or control an external environment through sensors, actuators and other I/O interfaces. These systems are inherently concurrent and require reliable software which satisfy timing constraints. This module provides an introduction to the fundamental principles underlying the specification, design and implementation of embedded systems with particular emphasis on the software.

Prerequisites: BCS209.

برنامج اللغويات الحاسوبية COMPUTATIONAL LINGUISTICS PROGRAM (COL)

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COMPUTATIONAL LINGUISTICS (COL) PROGRAM

MISSION

The Computational Linguistics program is committed to providing high quality undergraduate education that will prepare graduates for successful careers in computational linguistics and natural language processing fields to support the local, regional, and international needs within the framework of human and moral values.

MAIN GOALS

The computational linguistics program is designed to qualify students for a successful professional career in the fields of computer science, computational linguistics, and natural language proessing. This is based on a solid foundation in technical and managerial abilities, professional skills and contemporary communication skills, mastering the techniques of integrated processes. The program also aims to provide students with the skills to deal with developments in modern technologies and gain competitive advantages. This is to prepare graduates at the high professional level to meet the technical and social challenges of the future and to continue their studies at the postgraduate level. To achieve this task, the objectives of the computational linguistics program can be summarized as follows:

- 1. Providing students with the ability to apply knowledge in mathematics and basic sciences to model problems related to computational linguistics and natural language processing.
- 2. Providing students with a solid background in the fields of computer science, computational linguistics, and natural language processing.
- 3. Enabling students to integrate various analysis and design methodologies, models, techniques, and tools to develop natural language processing computer systems.
- 4. Prepare students to cope with the ever-evolving disciplines of computational linguistics and natural language processing technologies.
- 5. Providing students with the communication skills and responsible teamwork, establish professional attitudes and ethics, so that graduates are prepared for a complex modern work environment and lifelong learning.

COMPUTATIONAL LINGUISTICS PROGRAM COURSES CLASSIFICATION AND PERCENTAGES

#	Subject Area	CR	%
А	Univ. Requirements (Humanities and Social Sciences)	12	8.82%
В	Mathematics & basic Sciences	24	17.65%
C	Basic Computing Sciences (Institution Requirements)	36	26.47%
D	Applied Computing Sciences (specialization)	51	37.5%
E	Training	6	4.41%
F	Projects	7	5.15%
		136	100



COMPUTATIONAL LINGUISTICS PROGRAM LIST OF COURSES

Code	Course	CR	Lec	Tut	Lab	Pre Req.
	Req.) (12 Crea	dits)			
GEN000	English Language (A remedy course)	0	0	0	0	
GEN201	Transparency & Human Rights	1	1	•	0	
GEN301	Current Social Issues in Egypt	1	1	0	0	
GEN401	Professional Ethics	2	1	2	0	
GEN10X	Elective (1) From Language Courses List	2	1	2	0	
GEN104	History of Science, Engineering & Technology	2	2	0	0	
GEN202	Communication & Presentation Skills	2	1	0	3	
GEN407	Entrepreneurship	2	1	2	0	
	(B) Mathematics & basic Science Cou	rses (2	4 Credi	ts)		
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS120
BAS209	Statistical Analysis	3	2	2	0	BAS201
	(C) Basic Computing Sciences (Institution Require	ements) cours	es (36 C	Credits	;)
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS204	Fundamentals of Databases	3	2	0	3	BCS206
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206
BCS209	Computer Architecture	3	2	0	3	BCS207
BCS210	Operating Systems	3	2	0	3	BCS101
BCS311	Artificial Intelligence	3	2	0	3	BAS122, BAS201
BCS112	Technical Report Writing	3	2	2	0	-
COL301	Systems Analysis and Design	3	2	0	3	
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COL302	Automata and Word Processor	3	2	0	3	
COL303	Software Engineering	3	2	3	0	COL301
COL304	Information Retrieval	3	2	0	3	COL301
COL305	Artificial Neural Networks	3	2	0	3	BAS123+BAS201
COL306	Linguistics Analysis	3	2	2	0	BCS311
COL307	Machine Learning	3	2	0	3	BCS311
COL308	Fundamental of Speech Analysis	3	2	0	3	BAS302
COL401	Speech Syntheses, Recognition and Generation	3	2	0	3	COL308
COL402	Natural Language Processing	3	2	0	3	COL306 + BCS311
COL403	Text Mining	3	2	0	3	COL307
COL404	Linguistic Resources	3	2	0	3	COL402
COL3xx	Elective (2) (Elective Courses List)	3	2	0	3	ххх
COL3xx	Elective (3) (Elective Courses List)	3	2	0	3	ХХХ
COL4xx	Elective (4) (Elective Courses List)	3	2	0	3	ххх
COL4xx	Elective (5) (Elective Courses List)	3	2	0	3	ХХХ
COL4xx	Elective (6) (Elective Courses List)	3	2	0	3	ХХХ
(E) Training (6 Credits)						
COL230	Field Training (I)	3	0	0	6	60 Credits
COL340	Field Training (II)	3	0	0	6	90 Credits
	(F) Projects (7 Credits	;)				
COL440	Graduation Project (1)	3	0	6	0	100 Credits
COL450	Graduation Project (2)	4	0	8	0	COL440
	Elective Courses					
COL311	Computer Arabization	3	2	0	3	-
COL420	NLP Arabic Applications	3	2	0	3	COL311 + COL402
COL313	Search Engines	3	2	0	3	COL303
COL314	Pattern Recognition	3	2	0	3	-
COL411	Advanced Topics in Computational Linguistics	3	2	0	3	BCS311
COL412	Knowledge Representation and Reasoning	3	2	0	3	BCS311
COL413	Natural Language Understanding	3	2	0	3	COL402
COL414	Natural Language Applications	3	2	0	3	COL402
COL415	Biomedical Natural Language Processing	3	2	0	3	COL402
COL416	Deep Learning for Natural Language Processing	3	2	0	3	COL402 + COL305
COL417	Big Data Analysis	3	2	0	3	BAS201
COL418	Human-Computer Interaction	3	2	0	3	
COL419	Advanced Topics of Speech Analysis	3	2	0	3	COL308

COMPUTATIONAL LINGUISTICS (COL) PROGRAM STUDY PLAN

COMPUTATIONAL LINGUISTICS (COL) PROGRAM

1st Level

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN104	History of Science, Engineering & Technology	2	2	0	0	-
BAS101	Differential and Integral Calculus	3	2	2	0	-
BAS102	Physics	3	2	0	3	-
BAS103	Discrete Mathematics	3	2	2	0	-
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
		17	12	4	9	

FIRST SEMESTER

SECOND SEMESTER

		Cre	Con	tact Ho	ours		
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
GEN10X	Elective (1) From Language Courses List	2	1	2	0		
BAS123	Linear Algebra	3	2	2	0	-	
BAS124	Electronics	3	2	0	3	-	
BCS103	Object Oriented Programming	3	2	0	3	BCS102	
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101	
BCS112	Technical Report Writing	3	2	2	0	-	
		17	11	6	9		

COMPUTATIONAL LINGUISTICS (COL) PROGRAM

2nd Level

		Cre	Con	tact Ho	ours		
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
GEN202	Communication & Presentation Skills	2	1	0	3		
GEN201	Transparency & Human Rights	1	0	•	0		
BAS201	Probability and Statistical Methods	3	2	2	0	-	
BAS203	Differential Equations	3	2	2	0	BAS120	
BCS206	Data Structures	3	2	0	3	BCS102	
BCS207	Logic Design	3	2	0	3	BAS124	
		15	9	4	9		

FIRST SEMESTER

SECOND SEMESTER

		Cre	Contact Hours				
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
BAS225	Statistical Analysis	3	2	2	0	BAS201	
BCS204	Fundamentals of Databases	3	2	0	3	BCS206	
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206	
BCS209	Computer Architecture	3	2	0	3	BCS207	
BCS210	Operating Systems	3	2	0	3	BCS101	
		15	10	2	12		

SUMMER SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
COL230	Field Training (I)	3	0	0	6	60 Credits

STUDY PLAN FOR COMPUTATIONAL LINGUISTICS (COL) PROGRAM

3rd Level

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN301	Current Social Issues in Egypt	1	1	0	0	
BCS311	Artificial Intelligence	3	2	2	0	BAS122+ BAS201
COL301	System Analysis and Design	3	2	2	0	-
COL302	Automata and Word Processor	3	2	0	3	
COL303	Software Engineering	3	2	2	0	
COL304	Information Retrieval	3	2	0	3	
		16	11	6	6	

FIRST SEMESTER

SECOND SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
COL305	Artificial Neural Networks	3	2	0	3	
COL306	Linguistics Analysis	3	2	2	0	BCS311
COL307	Machine Learning	3	2	0	3	
COL308	Fundamental of Speech Analysis	3	2	2	0	
COL 3xx	Elective (2) (Elective Courses List)	3	2	0	3	
		15	10	4	9	

SUMMER SEMESTER

			Contact Hours				
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
COL340	Field Training (II)	3	0	0	6	90 Credits	

STUDY PLAN FOR COMPUTATIONAL LINGUISTICS (COL) PROGRAM

4th Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours		
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
GEN401	Professional Ethics	2	1	0	0		
COL401	Speech Syn., Recognition and Generation	3	2	0	3	COL308	
COL402	Natural Language Processing	3	2	0	3	COL306	
COL 4xx	Elective (3) (Elective Courses List)	3	2	0	3		
COL 4xx	Elective (4) (Elective Courses List)	3	2	0	3		
COL 440	Graduation Project (1)	3	0	6	0	100 Credits	
		17	9	6	12		

			Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN407	Entrepreneurship	2	1	2	0	
COL403	Text Mining	3	2	0	3	COL307
COL404	Linguistic Resources	3	2	0	3	COL402
COL4xx	Elective (5) (Elective Courses List)	3	2	0	3	
COL4xx	Elective (6) (Elective Courses List)	3	2	0	3	
COL450	Graduation Project (2)	4	0	8	0	COL440
		18	9	10	12	

SECOND SEMESTER

COMPUTATIONAL LINGUISTICS (COL) PROGRAM COURSE DESCRIPTIONS



COMPUTATIONAL LINGUISTICS PROGRAM COURSE DESCRIPTIONS

COL301 System Analysis and Design

This course introduces the students to the concepts and skills of system analysis and design. It includes expanded coverage of data flow diagrams, data dictionary, and process specifications. This course aims to as to introduce variety of new software used by analysts, designers to manage projects, analyze and document systems, design new systems and implement their plans. It introduces also a recent coverage of UML, wireless technologies and ERP; web-based systems for e-commerce and expanded coverage on RAD and GUI design.

Prerequisites: ---

COL302 Automata and Word Processor

This course teaches the general theory, concept, and techniques related to the theory of automata. Practical examples related to programming languages are emphasized. Students will have the opportunity to utilize theoretical aspects of automata theory by performing a medium-scale design project. Topics include: Finite Automata, Transition Graphs, Nondeterminism, Finite Automata with Output, Context-Free Grammars, Regular Grammars, Chomsky Normal Form, Pushdown Automata, Context-Free Languages, Non-Context-Free Languages, Parsing, and Turing Machines.

Prerequisites: --

COL303 Software Engineering

This course is designed to provide the student with principles and techniques for the design and construction of reliable, maintainable, and useful software systems. Software life cycle, requirements specifications, and verification and validation issues. Implementation strategies (e.g., top-down, bottom-up, teams), support for reuse, and performance improvement. Topics covered may also include: concepts of software engineering: requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance, Software support tools, Software project organization, quality assurance, management and communication skills.

Prerequisites: COL301.

COL304 Information Retrieval

The course includes Boolean retrieval, Processing Boolean queries, term vocabulary and postings list, Tokenization, Normalization, Stemming and lemmatization, Dictionaries and tolerant retrieval, Search structures for dictionaries, Spelling correction, Index construction, Index compression, Scoring, term weighting and the vector space model, Efficient scoring and ranking, Components of an information retrieval system, Evaluation in information retrieval.

Prerequisites: COL301.

3 (2,0,3)

3 (2,1,1)

3 (2,3,0)

This course introduces the basic models, learning algorithms, and some applications of neural networks. After this course, we should be able to know how to use neural networks for solving different problems related to pattern recognition, function approximation, data visualization, and so on. Topics in this course include: Basic neuron models, McCulloch-Pitts model and the generalized one, distance or similarity-based neuron model, radial basis function model, etc. Basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc. Basic learning algorithms: the delta learning rule, the back propagation algorithm, self-organization learning, the r4-rule, etc. Applications: pattern recognition, function approximation, information visualization, etc. Prerequisites: BAS123+BAS201

Artificial Neural Network

COL306 Linguistics Analysis The course will cover: Regular Expressions and Automata, N-grams, Part-of-Speech Tagging, Regular Expressions, Text Normalization, Edit Distance. N-gram Language Models, Naive Bayes and Sentiment Classification, Vector Semantics and Embeddings. It Also includes Sequence Labeling for Parts of Speech and Named Entities.

Prerequisites: BCS311.

COL305

COL307 Machine Learning

This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Prerequisites: BCS311.

COL308 Fundamental of Speech Analysis

Speech Sounds and Phonetic Transcription, Acoustic Phonetics and Signals, Hidden Markov and Maximum Entropy, Automatic Speech Recognition Task, Speech Recognition Architecture, ASR Evaluation: Word Error Rate.

Prerequisites: BAS302.

COL401 Speech Syntheses, Recognition and Generation

This course introduces students to the rapidly developing field of automatic speech recognition. Its content is divided into three parts. This course deals with background material in the acoustic theory of speech production, acoustic-phonetics, and signal representation. Also, it describes algorithmic aspects of speech recognition systems including pattern classification, search algorithms, stochastic modelling, and language modelling techniques. The course compares and

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

contrasts the various approaches to speech recognition, and describes advanced techniques used for acoustic-phonetic modelling, robust speech recognition, speaker adaptation, processing paralinguistic information, speech understanding, and multimodal processing.

Prerequisites: COL308

COL402 Natural Language Processing

This course is intended as a theoretical and methodological introduction to a the most widely used and effective current techniques, strategies and toolkits for natural language processing, with a primary focus on those available in the Python programming language. We will also consider how harnessing large digital corpora and large-scale textual data sources has changed how scholars engage with and evaluate digital archives and textual sources, and what opportunities textual repositories offer for computational approaches to the study of literature, history and a variety of other fields, including law, medicine, business and the social sciences. Topics in this course include: N-gram Language Models, Part Of Speech Tagging and Sequence Labeling, Syntactic parsing, Semantic Analysis, Information Extraction (IE) and Machine Translation.

Prerequisites: COL306 + BCS311

COL403 Text Mining

This course will cover the major techniques for mining and analyzing text data to discover interesting patterns, extract useful knowledge, and support decision making, with an emphasis on statistical approaches that can be generally applied to arbitrary text data in any natural language with no or minimum human effort. Detailed analysis of text data requires understanding of natural language text, which is known to be a difficult task for computers. However, a number of statistical approaches have been shown to work well for the "shallow" but robust analysis of text data for pattern finding and knowledge discovery. You will learn the basic concepts, principles, and major algorithms in text mining and their potential applications. In this course, we will cover important topics in text mining including basic natural language processing techniques, document representation, text categorization and clustering, document summarization, sentiment analysis, social network and social media analysis, probabilistic topic models and text visualization.

Prerequisites: COL307

COL404 Linguistic Resources

This course is an introduction to computerized research methods, which are applied to large data bases of language used in natural communicative settings to supplement more traditional ways of linguistic analysis in all linguistic sub-disciplines. The contents of this course are: Compiling corpora, The web as corpus, Corpus transcription and annotation and Frequency lists.

Prerequisites: COL402

COL 440 Graduation Project (1)

This course requires the students, working in teams, to take an actual project from the initial proposal stage through the preliminary design phase. Students will conduct the necessary activities and prepare the various documents needed to complete the preliminary design.

Prerequisites: 100 Credits

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

3 (0,6,0)

COL 450 Graduation Project (2) The design process will continue from the preliminary phase to the completion of a conceptual design of the project. The students, working in teams, will prepare requirements, design,

implementations of the project. A list and general description of the many details and other miscellaneous activities required to complete the project will also be prepared.

Prerequisites: COL 440

COL230	Field Training (I)	3 (0,0,6)						
The student is required to spend three weeks (5 days/each) in an industrial facility for training that								
is relevant t	is relevant to his/her field of study. The program council will assign a staff member to set the							
training pla	ו with the industrial partner and to follow up on the student's progress. A	t the end of						
the training	period, the student is required to submit a report and give a presentatio	on before an						
examination	n panel from the department and/or industrial partners. In the	report and						
presentatio	n, the student would highlight the achievements and/or challenges she/l	he has gone						
through dur	ing the training period. 60% of the student's score is provided by the indust	trial training						
supervisor	and the remaining 40% is determined based on: the student's r	eport, final						
presentation, and how well the student responds to the examination board questions.								
Droroquicitor	: 60 Credits							

Prerequisites: 60 Credits.

COL340 3 (0,0,6) Field Training (II) The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

Prerequisites: 90 Credits.

COL311 **Computer Arabization**

This course aims at understanding Arabization topics and to be able to develop applications to support Arabic in non-Arabic enabled environment or operating systems. Topics of this course are: Explain Arabization and Code pages, recognize Arabic shaping rules, recognize event-driven programming, Right-to-Left alignment for Arabic text, Ordering Rules and developing Arabic text editor.

Prerequisites: --

COL420 NLP Arabic Applications

This course provides system developers in natural language processing and computational linguistics with the necessary background information for working with the Arabic language.

3 (2,0,3)

3 (2,0,3)

3 (0 0 6)

4 (0,8,0)

The goal is to introduce Arabic linguistic phenomena and review the state-of-the-art in Arabic processing. The course discusses Arabic script, phonology, orthography, morphology, syntax and semantics, with a final chapter on machine translation issues. The course covers what is linguistically distinctive about Arabic, with morphology getting the lion's share, followed by Arabic script. It studies practical issues related to Arabic dialects and languages written in the Arabic script.

Prerequisites: COL311 + COL402

COL212 Counch Engin

COLSIS	Search Engines						3 (2,0,3)
This course introduces the foundational elements of how the most popular search engine,							
Google, wor	ks, how the Search	Engine C	Optimizatio	on (SEO) land	scape is cor	nstantly cha	inging. The
course discu	isses the core SEO s	strategies	s and taction	cs used to dri	ive more or	ganic searc	h results to
a specific we	ebsite or set of web	osites, as	well as tac	tics to avoid	preventing	penalizatio	n from
Google. In t	nis course you will l	learn to T	alk to Goo	gle, Link-scu	lpting and G	Google-frier	ndly Files
managemer	it, the concept of C	ontent N	larketing, j	oage audit ar	nd website,	PageRank,	Domain
Authority, a	nd Links. In additio	n, topics :	such as so	cial authority	and social	mentions w	/ill be
covered.							

Prerequisites: COL303.

COL314	Pattern Reco	gnition							3 (2,0,3)
This course will study state-of-the-art techniques for analyzing data. The goal is to extract									
meaningful	information fr	om feature	e data. Tł	nis inclu	des stat	tistica	l and inform	nation	
theoretic co	ncepts relatin	g to machi	ne learni	ng, data	mining	g and p	battern reco	ognition	. Topics of
this course a	are: Bayes Dec	ision Theo	ry, Lineai	r Classifi	iers, No	nlinea	ar Classifiers	s, Featur	re
Extraction a	nd Selection,	Dimensiona	ality Redu	uction, A	Additior	nal Fea	atures And ⁻	Templat	e Matching,
Context Dep	oendent Classi	fication an	d Cluster	ing.					
Prerequisites	:-								

COL411	Advanced Topics in Computational Linguistics	3 (2,0,3)				
The aims of this course are to build systems that understand what people mean when they						
speak or wr	speak or write, and that can produce linguistic strings that successfully express to people the					
intended co	ontent. Topics of this course are: What is Meaning? Lexical Semantics: Ov	erview and				
Senses, Sem	nantic Roles, Collocations and Other Multiword Expressions, Compositior	al Semantics				
Compositio	nal Semantics Beyond Predicate-Argument Structure, Beyond Sentences,	, Reference				
Resolution, Presupposition, Information Status and Information Structure, Implicature and						
Dialogue.						
intended co Senses, Sem Composition Resolution, Dialogue.	ontent. Topics of this course are: What is Meaning? Lexical Semantics: Ov nantic Roles, Collocations and Other Multiword Expressions, Composition nal Semantics Beyond Predicate-Argument Structure, Beyond Sentences, Presupposition, Information Status and Information Structure, Implicatu	erview and nal Semantics Reference re and				

Prerequisites: BCS311

COL412 Knowledge Representation and Reasoning

The aims of the course are to introduce key concepts of knowledge representation and its role in artificial intelligence, enable students to design and apply knowledge-based systems, and understand the limitations and complexity of algorithms for representing knowledge. The course

3 (2,0,3)

will begin with a review of basic concepts in first order logics, including syntax, semantic, and different deductive systems (Hilbert style systems, sequent calculus). We will then discuss resolution as a method for generating proofs, illustrate implementation strategies and limitations of resolution-based algorithms. As second major formalism we will introduce Description Logics for expressing terminological knowledge and ontologies. Description Logics form one of the foundations of the Semantic Web, and we will discuss a decision procedure for the basic Description Logic ALC as well as algorithms for different variants of ALC. In the third part of the course, we will introduce methods to represent and reason about common sense knowledge, including Default Logic and Circumscription, as well as Answer Set Programming. The final topic of the course will be about reasoning over actions and the application to knowledge-based planning.

COL413 Natural Language Understanding

Constituency Grammars, Context-Free Grammars, Grammar Rules for English, Treebanks, Lexicalized Grammars, Parsing, Partial Parsing, Dependency Parsing, Transition-Based Dependency Parsing, Graph-Based Dependency Parsing, Logical Representations of Sentence Meaning, Model-Theoretic Semantics, First-Order Logic, Word Senses and WordNet, Relations Between Senses, Using Thesauruses to Improve Embedding.

3 (2,0,3)

Prerequisites: COL402.

COL414	Natural Lan	guage App	lications					3 (2,0,3)
Machine T	ranslation a	nd Encode	er-Decoder	Models,	Encoder	-Decoder	with	Transformers,
Question Ar	swering, Ent	ity Linking,	Knowledge	e-based Q	uestion A	nswering,	Evaluat	ion of Factoid
Answers, Ch	atbots & Dia	logue Syste	ems, Simple	Frame-ba	ased Dialo	gue Syste	m.	
Droroquicitor								

Prerequisites: COL402

COL415	Biomedical Natural Language Processing	3 (2,0,3)
Students in	n this course will learn advanced techniques to parse and collate inf	ormation from
biomedical ⁻	text-rich and health documents such as electronic health records, clin	ical notes, and
peer-review	ved biomedical literature. Students will be able to delve deeper into	o challenges in
recognizing	; medical entities in text documents, extracting clinical information	on, addressing
ambiguity a	and polysemy, and building searchable interfaces to efficiently and ef	fectively query
and retrieve	e relevant patient data. <mark>Students will</mark> develop tools and techniques t	o analyze new
genres of h	health information and <mark>build resources to h</mark> elp in these tasks. Stud	lents will also
participate	in a semester-long project on addressing specific natural langua	ge processing
challenges i	in real-life health data sets. Students will have essential knowledge ab	out Biomedical
Resources,	Ontology (Gene ontology), Knowledgebase (PharmGKB), ICD codes, L	MLS, RxNorm,
SnoMed, Cli	linical Trial, I2B2	

Prerequisites: COL402.

COL416 Deep Learning for Natural Language Processing The course provides a deep excursion into cutting-edge research in deep learning applied to NLP. It involves training a complex recurrent neural network and applying it to a large-scale NLP problem. On the model side you will cover word vector representations, window-based neural networks, recurrent neural networks, long-short-term-memory models, recursive neural networks, convolutional neural networks as well as some very novel models involving a memory component. Students will learn the necessary engineering tricks for making neural networks work on practical problems.

Prerequisites: COL402 + COL305

COL417 **Big Data Analysis**

This course is to understand why the Big Data Era has come to be. This course focusses on the terminology and the core concepts behind big data problems, applications, and systems. It provides an introduction to one of the most common frameworks, Hadoop, that has made big data analysis easier and more accessible -- increasing the potential for data to transform our world Prerequisites: BAS201

COL418 Human Computer Interaction

Design and evaluation of effective user interaction designs, including principles and guidelines for designing interactive systems. Additionally, much emphasis is given to the development process for user interaction designs as an integral, but different, part of interactive software development. User interaction development activities include requirements and task analysis, usability specifications, design, prototyping, and evaluation. It is a goal of this course to help students realize that user interface development is an ongoing process throughout the full product life cycle and developing the human-computer interface is not something to be done at the last minute, when the "rest of the system" is finished.

Prerequisites: ---.

COL419 Advanced Topics of Speech Analysis

The aim of this course is to describe techniques used in, and architectures for, the design of state-of-the-art speech technology systems. These methods are starting to appear in many types of information processing and computer systems. The course focusses on the spoken dialogue systems and text-to-speech speech synthesis. Topics of this model include: Introduction to spoken dialogue systems, Requirements; basic grammar-driven systems, confidence measures and N-Best hypotheses, and state-of-the-art, approaches to semantic processing, robust parsing, template matching, statistical decoding, The flat concept model, the hierarchical model. Dialogue Act Decoding: Decision trees, belief networks, latent semantic analysis. Dialogue Management: Flow-chart methods, information update approach, statistical dialog management, Markov Decision Processes, the Hidden Information State model.

Prerequisites: COL308

3 (2,0,3)

3 (2,0,3)

برنامج علم البيانات DATA SCIENCE PROGRAM (DAS)

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DATA SCIENCE (DAS) PROGRAM

MISSION

The data science program (DAS) is committed to preparing a distinguished graduate who has the scientific and practical skills required to match progress in data science so that the graduate can compete in the labor market in the field of data science by implementing advanced education that contributes to enriching scientific research and community service.

MAIN GOALS

The data science program is designed to qualify students for a successful professional career in the fields of computer science, and data science. This is based on a solid foundation in technical and managerial abilities, professional skills, and new communication skills, mastering integrated processes. The program also aims to provide students with the skills to deal with modern technologies of data science and gain competitive advantages. It aims to prepare graduates at the high professional level to meet the technical and social challenges of the future.

To achieve this task, the objectives of the program can be summarized as follows:

- 1. Establish a career as a data scientist who possesses analytical tools for extracting knowledge from data, especially big data
- 2. Thoroughly analyze complex datasets in various domains and effectively communicate the results to domain specialists
- 3. Adhere to high standards of conduct, practice, and qualifications of the data science profession
- 4. Preparing a student with competence in the field of data science qualified with theoretical basics and application methodologies to qualify him for local and regional competition in developing methods of data science applications.
- 5. Achieving a link between the theoretical study of data science and the practical and applied aspect.
- 6. Preparing a student with academic and practical skills in the field of data science.
- 7. Conducting scientific and applied studies and research in the field of data science that have an impact on the integrated and sustainable development of society.
- 8. Applying best practices to create comprehensive project management and teamwork plan.
- 9. Providing a program based on the internationally known credit hour system that allows students to study according to their abilities and interests.
- 10. Providing more space for students for practical exercises that keep pace with work requirements in all institutions.

DATA SCIENCE PROGRAM (DAS) COURSES CLASSIFICATION AND PERCENTAGES

#	Subject Area	CR	%
А	Univ. Requirements (Humanities and Social Sciences)	12	8.82%
В	Mathematics & basic Sciences	24	17.65%
С	Basic Computing Sciences (Institution Requirements)	36	26.47%
D	Applied Computing Sciences (specialization)	51	37.5%
E	Training	6	4.41%
F	Projects	7	5.15%
		136	100



DATA SCIENCE PROGRAM (DAS) LIST OF COURSES

Code	Course	CR	Lec	Tut	Lab	Pre Req.
	(A) Humanities & Social Science (Univ.	Req.) (12 Crea	dits)		
GEN000	English Language (A remedy course)	0	0	0	0	
GEN201	Transparency & Human Rights	1	1	•	0	
GEN301	Current Social Issues in Egypt	1	1	0	0	
GEN401	Professional Ethics	2	1	2	0	
GEN10X	Elective (1) From Language Courses List	2	1	2	0	
GEN104	History of Science, Engineering & Technology	2	2	0	0	
GEN202	Communication & Presentation Skills	2	1	0	3	
GEN407	Entrepreneurship	2	1	2	0	
	(B) Mathematics & basic Science Cou	rses (2	4 Credi	ts)		
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS120
BAS209	Statistical Analysis	3	2	2	0	BAS201
	(C) Basic Computing Sciences (Institution Require	ements) cours	es (36 C	Credits	;)
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS204	Fundamentals of Databases	3	2	0	3	BCS206
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206
BCS209	Computer Architecture	3	2	0	3	BCS207
BCS210	Operating Systems	3	2	0	3	BCS101
BCS311	Artificial Intelligence	3	2	0	3	BAS122, BAS201
BCS213	Fundamentals of Data Science	3	2	0	3	BAS201

(D) Applied Computing Sciences (specialization) courses (51 Credits)							
DAS301	Software Engineering	3	2	0	3	BCS103	
DAS317	Modeling and Simulation	3	2	0	3	BCS311	
DAS303	Data Visualization and Data-Driven Decision-Making	3	1	0	3	BAS225	

DAS304	Machine Learning	3	2	0	3	BCS311	
DAS305	Numerical Methods	3	2	0	3	BAS201	
DAS306	Big Data Technologies	3	2	0	3	BCS311	
DAS307	Data Mining	3	2	0	3	BCS213	
DAS308	Applied Regression Methods	3	2	0	3	BCS213	
DAS409	Deep Learning	3	2	0	3	DAS304	
DAS410	Optimization Methods	3	2	0	3	BCS311	
DAS411	Text Mining	3	2	0	3	DAS307	
DAS412	Large-Scale Data Analysis	3	2	0	3	DAS306	
DAS3xx	Elective (2) (Elective Courses List)	3	Х	х	х		
DAS3xx	Elective (3) (Elective Courses List)	3	Х	х	х		
DAS4xx	Elective (4) (Elective Courses List)	3	Х	х	х		
DAS4xx	Elective (5) (Elective Courses List)	3	Х	х	х		
DAS4xx	Elective (6) (Elective Courses List)	3	Х	х	х		
	(E) Training (6 Credits)					
DAS230	Field Training (I)	3	0	0	6	60 Credits	
DAS340	Field Training (II)	3	0	0	6	90 Credits	
(F) Projects (7 Credits)							
DAS440	Graduation Project (1)	3	0	6	0	100 Credits	
DAS450	Graduation Project (2)	4	0	8	0	DAS440	
	Elective Courses						
DAS313	Applied Multivariate Analysis	3	2	0	3	DAS304	
DAS314	Biostatistics Methods	3	2	0	3	BAS225	
DAS315	Applied Data Science for Cyber Security	3	2	0	3	BCS213	
DAS316	Natural Language Processing	3	2	0	3	BCS311	
DAS415	Analysis of Time Series Data	3	2	0	3	DAS308	
DAS416	Selected Topics in Data Science	3	2	0	3	BCS213	
DAS417	Advanced Optimization Methods	3	2	0	3	DAS410	
DAS418	Mathematical Modeling with Applications	3	2	0	3	DAS305	
DAS419	Decision Support Systems and Business Intelligence	3	2	0	3	DAS306	
DAS420	Advanced Machine Learning	3	2	0	3	DAS304	
DAS421	Deep Reinforcement Learning	3	2	0	3	DAS409	
DAS422	Stochastic Methods	3	2	0	3	DAS308	
DAS423	Swarm Intelligence Algorithms	3	2	0	3	DAS410	
DAS424	Computer Vision	3	2	0	3	DAS304	
DAS425	Social Network Analysis	3	2	0	3	DAS303	
SAD426	Cloud Computing	3	2	0	3	BCS105	

DATA SCIENCE (DAS) PROGRAM STUDY PLAN

1st Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN104	History of Science, Eng. & Technology	2	2	0	0	-
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
		17	12	4	9	

SECOND SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN10X	Elective (1) From Language Courses List	2	1	2	0	
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BAS201	Probability and Statistical Methods	3	2	2	0	-
		17	11	4	12	

2nd Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN202	Communication & Presentation Skills	2	1	0	3	
BAS225	Statistical Analysis	3	2	2	0	BAS201
GEN201	Transparency & Human Rights	1	0	•	0	
BAS203	Differential Equations	3	2	2	0	BAS120
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
		15	9	4	9	

SECOND SEMESTER

				tact Ho	ours		
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
BCS210	Operating Systems	3	2	0	3	BCS101	
BCS204	Fundamentals of Databases		2	0	3	BCS206	
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206	
BCS209	Computer Architecture	3	2	0	3	BCS207	
BCS213	Fundamentals of Data Science	3	2	0	3	BAS201	
		15	10	2	12		

SUMMER SEMESTER

		Cre	Con	tact Ho	ours		
Code	Subject	edits	Lec.	Tut. Lab.		Prerequisites	
DAS230	Field Training (I)	3	0	0	6	60 Credits	

3rd Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours		
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
GEN301	Current Social Issues in Egypt	1	1	0	0		
BCS311	Artificial Intelligence	3	2	0	3	BAS122+ BAS201	
DAS301	Software Engineering	3	2	0	3	BCS103	
DAS308	Applied Regression Methods	3	2	0	3	BCS213	
DAS303	Data Visual. & Data-Driv. Decision-Making	3	2	0	3	BAS225	
DAS305	Numerical Methods	3	2	0	3	BCS311	
		16	11	0	15		

SECOND SEMESTER

			Con	tact Ho	ours		
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
DAS304	Machine Learning	3	2	0	3	BCS311	
DAS306	Big Data Technologies	3	2	0	3	BCS311	
DAS307	Data Mining	3	2	0	3	BCS213	
DAS317	Modeling and Simulation	3	2	0	3	DAS305	
DAS3xx	Elective (2) (Elective Courses List)	3	2	0	3		
		15	10	0	15		

SUMMER SEMESTER

		Cre	Con	tact Ho	ours	Prerequisites	
Code	Subject	edits	Lec.	Tut.	Lab.		
DAS340	Field Training (II)	3	0	0	6	90 Credits	

4th Level

FIRST SEMESTER

			Con	tact Ho	ours		
Code	Code Subject			Tut.	Lab.	Prerequisites	
GEN401	Professional Ethics	2	1	2	0		
DAS409	Deep Learning	3	2	0	3	DAS304	
DAS410	Optimization Methods	3	2	0	3	BCS311	
DAS4xx	Elective (3) (Elective Courses List)	3	2	0	3		
DAS4xx	Elective (4) (Elective Courses List)	3	2	0	3		
DAS440	Graduation Project (1)	3	0	6	0	100 Credits	
		17	9	8	12		

SECOND SEMESTER

			Con	tact Ho	ours		
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
GEN407	Entrepreneurship	2	1	2	0		
DAS411	Text Mining	3	2	0	3	DAS307	
DAS412	Large-Scale Data Analysis	3	2	0	3	DAS306	
DAS4xx	Elective (5) (Elective Courses List)	3	2	0	3		
DAS4xx	Elective (6) (Elective Courses List)	3	2	0	3		
DAS450	Graduation Project (2)	4	0	8	0	DAS440	
		18	9	10	12		



DATA ANALYSIS SCIENCE (DAS) PROGRAM COURSE DESCRIPTIONS

DATA ANALYSIS SCIENCE PROGRAM **COURSE DESCRIPTIONS**

DAS301 **Software Engineering** This course is designed to provide the student with principles and techniques for the design and construction of reliable, maintainable, and useful software systems. Software life cycle, requirements specifications, and verification and validation issues. Implementation strategies (e.g., top-down, bottom-up, teams), support for reuse, and performance improvement. Topics covered may also include: concepts of software engineering: requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance, Software support tools, Software project organization, quality assurance, management and communication skills.

Prerequisites: BCS103.

DAS303	Data Visualiz	zation and	Data-Driv	en Decision-	Making		3 (2,0,3)	
The amount and complexity of information produced in science, engineering, business, and								
everyday h	uman activit	y is incre	easing at	staggering	rates. The	course disc	cusses visual	
representat	ion methods a	and techni	ques that i	ncrease the	understand	ing of comple	x data. Good	
visualizatior	ns not only	present a	visual in	terpretation	of data,	but do so k	y improving	
comprehens	sion, commur	nication, a	nd decisio	n making. Iı	n this cours	e, you will le	arn how the	
human visua	al system proc	esses and J	perceives ii	mages, good	design prac	tices for visua	lization, tools	
for visualiza	tion of data f	from a var	iety of fiel	ds, and pro	gramming o	f interactive	visualizations	
using 3D.								

Prerequisites: BAS225.

DAS304 Machine Learning

This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Prerequisites: BCS311.

DAS305 Numerical Methods

Number systems and errors. Solution of nonlinear equations. Interpolation. Systems of linear equations. Approximation. Regression. Optimization. Differentiation and integration. Solution of ordinary differential equations. Introduction to the solution of partial differential equations by finite differences.

3 (2,0,3)

3 (2,0,3)

3 (1,0,3)

Prerequisites: BAS201.

DAS306 Big Data Technologies

The course introduces Big Data problems and associated frameworks and technologies. First, the course motivates the topic using real-world big data problems. Second, it sheds light on handling big data, from data collection, to monitoring, storage, analysis and reporting. The course also includes programming models used for scalable big data analysis. It also introduces one of the most common Big Data frameworks, namely Hadoop, in addition to the Map-Reduce Programming Model. Finally, it solves sample case studies using the covered Big Data analytics tools.

Prerequisites: BCS311.

DAS307Data Mining3 (2,0,3)The course provides students with an appreciation of the uses of data mining software in solving
business decision problems. Students will gain knowledge of theoretical background to several of
the commonly used data mining techniques and will learn about the application of data mining as
well as acquiring practical skills in the use of data mining algorithms. The contents of this course
include Knowledge discovery in databases, Data mining process, Data cleaning and preparation,
mining association rules, Classification, Prediction, Clustering, Web mining, Applications of data
mining, Mining advanced databases.

Prerequisites: BCS213.

DAS308 Applied Regression Methods

Standard least squares method and application to problems arising from social, biological and engineering sciences. Deviation from assumption of multicollinearity. Variable selection methods. Analysis of variance, generalized linear models including logistic regression models. Course includes an applied project (a thorough analysis of real-life data using computer packaged programs).

Prerequisites: BCS213.

DAS409 Deep Learning

Perceptron and multilayer neural networks, Gradient descent, Back-propagation, Convolutional Neural Network (CNN), pooling layers, CNN applications, Recurrent Neural Networks (RNN), vanishing gradient problem, case studies: object detection, and data streams and real time classification, GANs.

Prerequisites: DAS304.

DAS410 Optimization Methods

The course address optimization problems that arise in machine learning, as well as efficient algorithms to solve them. The course is proof-based, and contains both theory and applied exercises. Topics include convex analysis, first-order methods, convergence analysis, generalization and regret minimization, regularization, projection-free methods and the Frank-

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

Wolfe algorithm, zero-order optimization, convex bandit optimization, optimization for deep learning: large scale non-convex optimization, and meta-heuristics global optimization. Prerequisites: BCS311.

DAS411 Text Mining Investigates linguistic, statistical, and machine learning techniques for modeling the information in textual sources. Includes information retrieval, natural language processing, text classification, and sentiment analysis and the software systems for performing these analyses.

Prerequisites: DAS307.

DAS412 Large-Scale Data Analysis 2 (1,0,3) The course will provide a basic introduction to large scale data analysis methods, focusing on four main problem paradigms (prediction, clustering, modeling, and detection). The course will focus on prediction (both classification and regression) and clustering (identifying underlying group structure in data)

Prerequisites: DAS306.

DAS440 Graduation Project (1)

This course requires the students, working in teams, to take an actual project from the initial proposal stage through the preliminary design phase. Students will conduct the necessary activities and prepare the various documents needed to complete the preliminary design.

Prerequisites: 100 Credits

DAS450 Graduation Project (2)

The design process will continue from the preliminary phase to the completion of a conceptual design of the project. The students, working in teams, will prepare requirements, design, implementations of the project. A list and general description of the many details and other miscellaneous activities required to complete the project will also be prepared.

Prerequisites: DAS440

DAS230 Field Training (I)

The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

Prerequisites: 60 Credits.

3 (2,2,0)

3 (0,6,0)

4 (0,8,0)

3 (0,0,6)

Prerequisites: BCS213.

DAS316 Natural Language Processing

The course aims to familiarize students with recent research across a range of topics within NLP, mainly within the framework of neural network models, and with a focus on applications such as machine translation, summarization, and semantic parsing. As an MSc-level course that assumes

presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training

presentation, and how well the student responds to the examination board questions. Prerequisites: 90 Credits.

DAS313 Applied Multivariate Analysis

Techniques of multivariate statistical analysis illustrated by examples from various fields. Topics include: Multivariate normal distribution. Sample geometry and multivariate distances. Inference about a mean vector. Comparison of several multivariate means, variances, and covariances. Detection of multivariate outliers. Principle components. Multidimensional scaling. Factor analysis. Canonical correlation. Discriminant analysis. and Clustering. Course includes an applied project (a thorough analysis of real-life data sets using computer-packaged programs).

The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and

supervisor and the remaining 40% is determined based on: the student's report, final

Prerequisites: DAS304.

DAS314 Biostatistics Methods

This course is an introduction to important topics in biological, medical, health, and environmental statistical concepts and reasoning. Topics include: Introduction to Biological data Processing and Analysis, Hypothesis testing, nonparametric tests, Logistic regression, Poisson regression, Statistical methodologies in analysis of survival data (Kaplan-Meier estimator, Cox's proportional hazards models, time-dependent covariates, multiple failure outcomes). Typical biomedical applications, including clinical trials. The course includes an applied project using computer programming language such as R or Python.

Prerequisites: BAS225.

DAS315 Applied Data Science for Cyber Security

This course will teach security professionals how to use data science techniques to quickly manipulate and analyze network and security data and ultimately, uncover valuable insights. You will learn how to read data in common formats and write scripts to analyze and visualize that data. Topics range from data preparation and machine learning to model evaluation, optimization and implementation—at scale.

DAS340 Field Training (II)

2 (1,0,3)

3 (0,0,6)

3 (2,0,3)

3 (2,0,3)

70

previous experience with NLP, it will discuss a range of different issues, including linguistic/representational capacity, computational efficiency, optimization, etc. There is no textbook for the course; readings will come from recent research literature.

Prerequisites: BCS311.

DAS317 Modeling and Simulation

This course is an introduction to fundamental tools in designing, conducting, and interpreting simulation experiments. Topics covered include Random number generation; Continuous, discrete, and rare event simulations. Variance reduction techniques, Bootstrap and Jacknife; Simulation; Markov Chain Monte Carlo. The course includes an applied project (a thorough application of simulation to real-world problems such as finance, statistics) using computer programming language such as R or Python).

Prerequisites: BCS311.

DAS415 Analysis of Time Series Data

This course deals with the problems of modelling and forecasting time series data. Computer program packages are used as an aid for obtaining solutions. Topics include serial correlation, seasonal adjustments, exponential smoothing and extrapolation, state space models, moving average, autoregressive, ARMA and ARIMA models, and nonlinear time series, including ARCH models, ANN, and chaos. Emphasis on model building, diagnostic checking, and model selection. Prerequisites: BCS213.

DAS416 Selected Topics in Data Science

The course provides insight into selected contemporary relevant topics within Data Science. Students gain practical experience with data analysis and industry relevant algorithms and technologies for data analysis. Course content follows developments in the field.

Prerequisites: BCS213.

DAS417 Advanced Optimization Methods

Combinatorial optimization problems in large scale such as scheduling, matching, resource allocation, network and assignment problems, with real life applications. Graph modeling, minimum cost network flow problems and its reduction to shortest path and maximum flow problems. Discussion of graph algorithms as well as dual formulations such as the minimum cut problem. The course includes stochastic programming with examples.

Prerequisites: DAS410.

DAS418	wathematical wodeling with Applications	3 (2,0,3)				
Introduction to stochastic modeling and its applications in actuarial and financial problems.						
Overview or	Overview on models in discrete and continuous times involving Random walk, Brownian motion,					
Poisson and	Poisson and compound Poisson processes. Introduction to stochastic differential equations, Ito					
calculus and	l diffusion processes. Applications in risk theory, and pricing problems and	d credit risk.				
Prerequisites	: DAS305.					

3 (2,2,0)

3 (2,0,3)

3 (2,0,3)

3 (2,2,0)

DAS419 Decision Support Systems and Business Intelligence This course will demonstrate in the real environment managerial applications such as the basics of the MS SQL data mining and will provide the knowledge about the possibilities of Business Intelligence (BI) use. It will examine the BI tasks management, critical success factors of BI, planning and analysis design and modeling design, development and implementation of information technology-based systems that support managerial and professional work, including

Communications-Driven and Group Decision Support Systems (GDSS), Data-Driven DSS, Model-

Prerequisites: DAS306.

DAS420 Advanced Machine Learning

Driven DSS and Knowledge-Driven DSS.

This is an advanced course on machine learning, focusing on recent advances in deep learning with neural networks, such as recurrent and Bayesian neural networks. The course will concentrate especially on natural language understanding (NLU) and computer vision applications. Recent statistical techniques based on neural networks have achieved a remarkable progress in these fields, leading to a great deal of commercial and academic interest. The course will introduce the mathematical definitions of the relevant machine learning models and derive their associated optimization algorithms. It will cover a range of applications of neural networks in natural language processing, including analyzing latent dimensions in text, translating between languages, and answering questions.

Prerequisites: DAS304.

DAS421 Deep Reinforcement Learning

This course introduces deep reinforcement learning (RL), one of the most modern techniques of machine learning. Deep RL has attracted the attention of many researchers and developers in recent years due to its wide range of applications in a variety of fields such as robotics, robotic surgery, pattern recognition, diagnosis based on medical image, treatment strategies in clinical decision making, personalized medical treatment, drug discovery, speech recognition, computer vision, and natural language processing. Deep RL is often seen as the third area of machine learning, in addition to supervised and unsupervised algorithms, in which learning of an agent occurs as a result of its own actions and interaction with the environment. Generally, such learning processes do not need to be guided externally, but it has been difficult until recently to use RL ideas practically. This course primarily focuses on problems that emerge in healthcare and life science applications.

Prerequisites: DAS409.

DAS422 Stochastic Methods

Introduction to stochastic process, discrete time Markov chain, Poisson process, Compound Poisson Processes and Renewal Processes, continuous-time Markov Chain, Transition probabilities and limiting behavior for Markov Chains, Martingales, Brownian Motion, applications in finance and insurance.

Prerequisites: DAS308.

3 (0,6,0)

4 (3,0,3)

3 (2,0,3)

DAS423 Swarm Intelligence Algorithms

This course aims to let students have a basic understanding of swarm intelligence principles and applications. Swarm intelligence is the discipline that deals with natural and artificial systems composed of many individuals that coordinate using decentralized control and self-organization. In particular, the discipline focuses on the collective behaviors that result from the local interactions of the individuals with each other and with their environment. Examples of systems studied by swarm intelligence are colonies of ants and termites, schools of fish, flocks of birds, herds of land animals. Some human artifacts also fall into the domain of swarm intelligence, notably some multi-robot systems, and also certain computer programs that are written to tackle optimization and data analysis problems. The course will present a number of swarm intelligence systems and will give the opportunity to experiment with them.

Prerequisites: DAS410.

DAS424 Computer Vision

This course provides an introduction to computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, scene understanding, and deep learning with neural networks. Topics may also include Filtering, Image Representations, and Texture Models, Color Vision, Multi-view Geometry, Projective Reconstruction, Bayesian Vision; Statistical Classifiers, Clustering & Segmentation; Voting Methods, Tracking and Density Propagation, Visual Surveillance and Activity Monitoring, Medical Imaging, Image Databases, Image-Based Rendering

Prerequisites: DAS304.

DAS425 Social Network Analysis

This course is an introduction to the concepts and methods of social network analysis. Students will learn to extract and manage data about network structure and dynamics, and to analyze, model and visualize such data. Students will use software tools to model and visualize network structure and dynamics. Specific network applications to be discussed include online social networks, collaboration networks, and communication networks

Prerequisites: DAS303.

SAD426 Cloud Computing

This course contains overview of Distributed Computing: Trends of computing, introduction to distributed computing, next big thing: Cloud computing. Cloud computing properties and characteristics, service models, deployment models. Attributes of Cloud computing: Multi-tenancy – a single instance of software or other computing resource serving several clients, massive scalability – ability to support hundreds of thousands of clients at the same time, elasticity – ability to grow or contract on demand, on-demand self-provisioning of resources. Infrastructure

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

-as-a-Service (IaaS): Introduction to IaaS, resource (i.e., server, storage and network) virtualization, case studies. Platform-as-a-Service (PaaS): Introduction to PaaS. Cloud platform, management of computation and storage, case studies. Software-as-a-Service (SaaS): Introduction to SaaS, Web services, Web 2.0, Web OS, case studies. Cloud issues and challenges: Cloud provider lock-in or vendor lock-in, security of Cloud computing.

Prerequisites: BCS105.

SAD427	Distributed S	Systems	3 (2,0,3)				
The goals o	The goals of this course are twofold: First, students will gain an understanding of the principles						
and technic	and techniques behind the design of distributed systems, such as locking, concurrency,						
scheduling,	and communi	cation across networks. Second, students will gain practical	experience				
in designing	g, implementin	g, and debugging real distributed systems.					
The major t	hemes this cou	urse will teach include process distribution and communica	tion, data				
distribution	, scheduling, c	oncurrency, resource sharing, synchronization, naming, abs	straction				
and modula	irity, failure ha	ndling, protection from accidental and malicious harm, dist	ributed				
programmi	ng models, dist	tributed file systems, virtualization, and the use of instrume	entation,				
monitoring	and debugging	g tools in problem solving. As the creation and managemen	t of				
software sy	stems is a fund	damental goal of any undergraduate systems course, stude	nts will				
design, imp	lement, and de	ebug large programming projects. Students will learn the de	esign				
and implem	entation of to	day's popular distributed system paradigms, such as Google	e File				
System and	ManReduce.						

Prerequisites: BCS210.

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برنامج تطوير البرامج والتطبيقات SOFTWARE AND APPLICATION DEVELOPMENT PROGRAM

(SAD)

BNU

SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM

MISSION

The "Software and Application Development" program is committed to preparing those who are qualified in building, designing, developing, testing and documenting software and applications according to standard methodologies and modern tools by providing a pioneering research educational environment that stimulates creativity and excellence supported by updated teaching plans, capable teaching competencies and applied research projects that meet the needs of society.

MAIN GOALS

The "Software and Application Development" program will prepare our students to be successful professionals in the field with solid fundamental knowledge of software and application development. The program combines the science and technology of design, as well as the implementation and maintenance of software. It prepares the students to apply a structured approach to the development of a software. It gives the students the chance to experience different career opportunities and get introduced to different paths. To achieve this task, the objectives of the program can be summarized as follows:

- 1. Be successful professionals in the field with solid fundamental knowledge of software and application development
- 2. Comprehends and applies principles of programming; effectively translates design specifications into appropriate software components.
- 3. Apply their foundations in software and application development to adapt to readily changing environments using the appropriate theory, principles and processes
- 4. Utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi-disciplinary teams

SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM COURSES CLASSIFICATION AND PERCENTAGES

#	Subject Area	CR	%
А	Univ. Requirements (Humanities and Social Sciences)	12	8.82%
В	Mathematics & basic Sciences	24	17.65%
С	Basic Computing Sciences (Institution Requirements)	36	26.47%
D	Applied Computing Sciences (specialization)	51	37.5%
E	Training	6	4.41%
F	Projects	7	5.15%
		136	100


SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM LIST OF COURSES

Code	Course	CR	Lec	Tut	Lab	Pre Req.
	(A) Humanities & Social Science (Univ.	Req.) (12 Crea	dits)		
GEN000	English Language (A remedy course)	0	0	0	0	
GEN201	Transparency & Human Rights	1	1	•	0	
GEN301	Current Social Issues in Egypt	1	1	0	0	
GEN401	Professional Ethics	2	1	2	0	
GEN10X	Elective (1) From Language Courses List	2	1	2	0	
GEN104	History of Science, Engineering & Technology	2	2	0	0	
GEN202	Communication & Presentation Skills	2	1	0	3	
GEN407	Entrepreneurship	2	1	2	0	
	(B) Mathematics & basic Science Cou	rses (24	4 Credit	ts)		
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS120
BAS209	Statistical Analysis	3	2	2	0	BAS201
	(C) Basic Computing Sciences (Institution Require	ements) cours	es (36 C	Credits)
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS204	Fundamentals of Databases	3	2	0	3	BCS206
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206
BCS209	Computer Architecture	3	2	0	3	BCS207
BCS210	Operating Systems	3	2	0	3	BCS101
BCS311	Artificial Intelligence	3	2	0	3	BAS122, BAS201
BCS112	Technical Report Writing	3	2	2	0	-

(D) Applied Computing Sciences (specialization) courses (51 Credits)						
SAD301	Software Engineering 1	3	2	0	3	BCS103
SAD313	Information Storage and Management	3	2	0	3	BCS105
SAD303	SAD303 Web Development 2 1 0 3 BCS102					

SAD304	Machine Learning	3	2	0	3	BCS311	
SAD305	Computer Graphics	3	2	0	3	BAS123	
SAD306	Software Project Management	3	2	0	3	-	
SAD307	Mobile Application Development	3	2	0	3	BCS103	
SAD308	Software Requirement Analysis	3	2	0	3	SAD301	
SAD409	Image Processing	4	3	0	3	BAS123	
SAD410	Software Security	3	2	0	3	SAD301	
SAD411	Computer Vision	3	2	0	3	SAD409	
SAD412	Software Testing & Quality Assurance	3	2	0	3	SAD301	
SAD3xx	Elective (2) (Elective Courses List)	3	х	х	х	ххх	
SAD4xx	Elective (3) (Elective Courses List)	3	х	х	х	ххх	
SAD4xx	Elective (4) (Elective Courses List)	3	х	х	х	ххх	
SAD4xx	Elective (5) (Elective Courses List)	3	х	х	х	ххх	
SAD4xx	Elective (6) (Elective Courses List)	3	х	х	х	ххх	
(E) Training (6 Credits)							
SAD230	Field Training (I)	3	0	0	6	60 Credits	
SAD340	Field Training (II)	3	0	0	6	90 Credits	
(F) Projects (7 Credits)							
SAD440	Graduation Project (1)	3	0	6	0	100 Credits	
SAD450	Graduation Project (2)	4	0	8	0	SAD440	
Elective Courses							
	Elective Courses						
SAD302	Elective Courses Assembly Language	3	2	0	3	BCS209	
SAD302 SAD314	Elective Courses Assembly Language Social Media & Digital Marketing	3 3	2 2	0	3	BCS209 -	
SAD302 SAD314 SAD315	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development	3 3 3	2 2 2	0 0 0	3 3 3	BCS209 - BCS103	
SAD302 SAD314 SAD315 SAD316	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture	3 3 3 3	2 2 2 2	0 0 0 0	3 3 3 3	BCS209 - BCS103 SAD301	
SAD302 SAD314 SAD315 SAD316 SAD417	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction	3 3 3 3 3 3	2 2 2 2 2 2	0 0 0 0	3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases	3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2	0 0 0 0 0 0	3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking	3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 -	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing	3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing Enterprise Architecture	3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420 SAD421	Elective CoursesAssembly LanguageSocial Media & Digital MarketingOpen-Source Software DevelopmentSoftware Design & ArchitectureSoftware ConstructionAdvanced DatabasesEthical HackingCloud ComputingEnterprise ArchitectureBig Data Analytics	3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420 SAD421 SAD423	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing Enterprise Architecture Big Data Analytics Data Mining	3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201 BAS201	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420 SAD421 SAD423 SAD424	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing Enterprise Architecture Big Data Analytics Data Mining Internet of Things	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201 BAS201 BAS201 BCS105	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420 SAD421 SAD423 SAD424	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing Enterprise Architecture Big Data Analytics Data Mining Internet of Things Agile Methods	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201 BAS201 BCS105 SAD301	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420 SAD421 SAD422 SAD423 SAD424 SAD425	Elective CoursesAssembly LanguageSocial Media & Digital MarketingOpen-Source Software DevelopmentSoftware Design & ArchitectureSoftware ConstructionAdvanced DatabasesEthical HackingCloud ComputingEnterprise ArchitectureBig Data AnalyticsData MiningInternet of ThingsAgile MethodsSoftware Engineering 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201 BAS201 BAS201 BAS201 SAD301 SAD301	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD417 SAD419 SAD420 SAD421 SAD422 SAD423 SAD425 SAD426	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing Enterprise Architecture Big Data Analytics Data Mining Internet of Things Agile Methods Software Engineering 2 Distributed Systems	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201 BAS201 BAS201 BCS105 SAD301 SAD301 SAD301 BCS310	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD418 SAD419 SAD420 SAD421 SAD422 SAD423 SAD424 SAD425 SAD426 SAD428	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing Enterprise Architecture Big Data Analytics Data Mining Internet of Things Agile Methods Software Engineering 2 Distributed Systems Game Development	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201 BAS201 BAS201 BAS201 SAD301 SAD301 SAD301 BCS310 BCS103	
SAD302 SAD314 SAD315 SAD316 SAD417 SAD417 SAD419 SAD420 SAD421 SAD422 SAD423 SAD424 SAD425 SAD426 SAD427 SAD428 SAD429	Elective Courses Assembly Language Social Media & Digital Marketing Open-Source Software Development Software Design & Architecture Software Construction Advanced Databases Ethical Hacking Cloud Computing Enterprise Architecture Big Data Analytics Data Mining Internet of Things Agile Methods Software Engineering 2 Distributed Systems Game Development	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	BCS209 - BCS103 SAD301 SAD301 BCS204 - BCS105 SAD301 BAS201 BAS201 BAS201 BAS201 BCS105 SAD301 SAD301 BCS103 SAD301	

SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM STUDY PLAN

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SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM

1st Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN104	History of Sci., Engineering & Technology	2	2	0	0	-
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
		17	12	4	9	

SECOND SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN10X	Elective (1) From Language Courses List	2	1	2	0	
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BCS112	Technical Report Writing	3	2	2	0	-
		17	11	6	9	

SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM

2nd Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN202	Communication & Presentation Skills	2	1	0	3	
GEN201	Transparency & Human Rights	1	0	•	0	
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS120
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2	0	3	BAS124
		15	9	4	9	

SECOND SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
BAS225	Statistical Analysis	3	2	2	0	BAS201
BCS204	Fundamentals of Databases	3	2	0	3	BCS206
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206
BCS209	Computer Architecture	3	2	0	3	BCS207
BCS210	Operating Systems	3	2	0	3	BCS101
		15	10	2	12	

SUMMER SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
SAD230	Field Training (I)	3	0	0	6	60 Credits

STUDY PLAN FOR SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM

3rd Level

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN301	Current Social Issues in Egypt	1	1	0	0	
BCS311	Artificial Intelligence	3	2	0	3	BAS122+ BAS201
SAD301	Software Engineering 1	3	2	0	3	BCS103
SAD313	Information Storage and Management	3	2	0	3	BCS105
SAD303	Web Development	3	2	0	3	BCS102
SAD305	Computer Graphics	3	2	0	3	BAS123
		16	11	0	15	

FIRST SEMESTER

SECOND SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
SAD304	Machine Learning	3	2	0	3	BCS311
SAD306	Software Project Management	3	2	0	3	-
SAD307	Mobile Application Development	3	2	0	3	BCS103
SAD308	Software Requirement Analysis	3	2	0	3	SAD301
SAD 3xx	Elective (2) (Elective Courses List)	3	2	0	3	
		15	10	0	15	

SUMMER SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
SAD340	Field Training (II)	3	0	0	6	90 Credits

STUDY PLAN FOR SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM

4th Level

FIRST SEMESTER	2
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		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN401	Professional Ethics	2	1	2	0	
SAD409	Image Processing	3	2	0	3	BAS123
SAD410	Software Security	3	2	0	3	SAD301
SAD4xx	Elective (3) (Elective Courses List)	3	2	0	3	
SAD4xx	Elective (4) (Elective Courses List)	3	2	0	3	
SAD440	Graduation Project (1)	3	0 6 0		0	100 Credits
		17	9	8	12	

			Contact Hours					
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites		
GEN407	Entrepreneurship	2	1	2	0			
SAD411	Computer Vision	3	2	0	3	SAD409		
SAD412	Software Testing & Quality Assurance	3	2	0	3	SAD301		
SAD4xx	Elective (5) (Elective Courses List)	3	2	0	3			
SAD4xx	Elective (6) (Elective Courses List)	3	2	0	3			
SAD450	Graduation Project (2)	4	0	8	0	SAD440		
		18	9	10	12			

SECOND SEMESTER

SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM COURSE DESCRIPTIONS



SOFTWARE AND APPLICATION DEVELOPMENT (SAD) PROGRAM COURSE DESCRIPTIONS

BCS310Operating systems3 (2,0,3)Topics include: Principles of operating systems, design objectives, sequential processes,
concurrent processes, concurrency, functional mutual exclusion, processor cooperation and
deadlocks, processor management, Control and scheduling of large information processing
systems, Resource allocation, dispatching, processor access methods, job control languages,
Memory management, memory addressing, paging and store multiplexing, Multiprocessing and
time sharing, batch processing, Scheduling algorithms, file systems, protection and security,
design and implementation methodology, performance evaluation and case studies.

Prerequisites: BCS101.

BCS311 Artificial Intelligence

Topics covered may include: Survey and concepts in Artificial Intelligence, Problem solving agents, Uninformed and Informed search techniques, Game playing, Knowledge representation, Inference in Propositional and First Order logic, Theorem Proving, Decision tree learning, Neural Network, Bayesian learning, planning.

Prerequisites: BAS123 +BAS201.

SAD301 Software Engineering 1

This course is designed to provide the student with principles and techniques for the design and construction of reliable, maintainable, and useful software systems. Software life cycle, requirements specifications, and verification and validation issues. Implementation strategies (e.g., top-down, bottom-up, teams), support for reuse, and performance improvement. Topics covered may also include: concepts of software engineering: requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance, Software support tools, Software project organization, quality assurance, management and communication skills.

Prerequisites: BCS103

SAD302 Assembly Language

This course introduces assembly language programming and machine language concepts. Internal communication structure, memory interface components, Input Output processors, Direct Memory Access technique are discussed. The role of interrupts and interrupt handling techniques are also introduced. The students are given training in developing assembly language programs for simple problems during the theoretical and practical sessions.

Prerequisites: BCS209

SAD303Web development3 (2,0,3)This course is designed to provide the student with foundational programming knowledge and
skills for application development on the Internet. The student will learn about the Web as a

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

development platform through the use of popular representative languages (such as PHP). The student will learn to plan, design, construct, and integrate basic server-side components of modern web applications including databases and scripts. Topics covered may include: Web architecture and HTTP: History and architecture of the World Wide Web, overview of the Hyper Text Transfer Protocol, other related protocols; Hyper Text Markup Language: The concept of markup, overview of HTML (table, form, frame, window, link etc.); Client side scripting: Variables, data types, control structure, functions, Document Object Model (DOM), event handlers, properties, methods, cookies; Server side scripting: Concepts, variables, data types, control structure, functions, objects; Database: Content generation, data exchange; Regular expressions, mails, cookies, sessions.

Prerequisites: BCS102.

SAD304 Machine Learning

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Prerequisites: BCS311.

SAD305 Computer Graphics

Topics covered include: introduction to Graphical data processing, Fundamentals of interactive graphics programming, Architecture of display devices and connectivity to a computer, Implementation of graphics concepts of two-dimensional and three-dimensional viewing, clipping and transformations, Hidden line algorithms, Raster graphics concepts: Architecture, algorithms and other image synthesis methods, Design of interactive graphic conversations

Prerequisites: BAS123.

SAD306 Software Project Management

Evaluation, selection, and organization of technical projects. Concepts of the network-based project management methodology. Network development. Project planning, scheduling, and control. Project cost management. Resource constrained projects. A case study approach is adopted during the course. Commercial software packages will be used throughout the course. The course will also introduce some contemporary project management subjects such as: e-projects, and Intelligent project management

Prerequisites: non

SAD307 Mobile Application Development

3 (2,0,3)

There are more mobile devices on the planet than people. Mobile app development helps to unleash the full power of mobile devices and push their usage into every corner of modern society.

This course introduces students to important concepts and aspects in mobile application development on Java based Android phones, including UI design, data persistence, multimedia support, sensor management, multithreading, debug and test, and application publishing. Although the course is centered on Android, general principles of mobile app development discussed here can also be applied to other contexts.

Prerequisites: BCS103

SAD308 Software Requirement Analysis

Topics include: Techniques for discovering and eliciting requirements. Languages and models for representing requirements. Analysis and validation techniques, including need, goal, and use case analysis. Requirements in the context of system engineering. Specifying and measuring external qualities: performance, reliability, availability, safety, security, etc. Specifying and analyzing requirements for various types of systems: embedded systems, consumer systems, web-based systems, business systems, systems for scientists and other engineers. Resolving feature interactions. Requirements documentation standards. Traceability. Human factors. Requirements in the context of agile processes. Requirements management: Handling requirements changes. Prerequisites: SAD301.

SAD409 Image Processing

Digital image fundamentals: Visual perception, sensing, acquisition, sampling, quantization. Intensity transformation and spatial filtering: Different transformations, histogram, correlation and convolution, smoothing and sharpening filters. Filtering in frequency domain: Discrete-Fourier-Transformation (DFT) of image, smoothing and sharpening in frequency domain, selective filtering. Image restoration and reconstruction: Noise models, spatial filtering for noise, frequency filtering for noise, reconstruction from projections. Color image processing: Color models, color transformation and segmentation. Morphological image processing: Erosion, dilation, opening, closing, morphological algorithms. Image compression: Redundancy, fidelity criteria, some basic compression techniques. Image segmentation: Point, line and edge detection, thresholding, region based segmentation. Object recognition: Matching, statistical classifier, neural networks. Analysis, design and visualization tools: MATLAB, IP toolbox, CV toolbox.

Prerequisites: BAS123.

SAD410	Software Security	3 (2,0,3)							
This course we will explore the foundations of software security. We will consider important									
software vulnerabilities and attacks that exploit them such as buffer overflows, SQL injection,									
and session	hijacking and we will consider defenses that prevent or mitigate th	ese attacks,							
including advanced testing and program analysis techniques. Importantly, we take a "build									
security in" mentality, considering techniques at each phase of the development cycle that can be									
used to stre	ngthen the security of software systems								

Prerequisites: SAD301

Vision

3 (2,0,3)

This course provides an introduction to computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, scene understanding, and deep learning with neural networks. Prerequisites: SAD409

SAD412 Software Testing and Quality Assurance

The aim and objective of this course is to teach students the concepts and skills needed for Software quality assurance and Testing. Software quality assurance is viewed as an activity that runs through the entire development process. It encompasses activities and related techniques to ensure the implementation of appropriate functionality that satisfy the requirements/needs of its targeted client/users for the intended software system, product, or service, both correctly and efficiently. Inspections and reviews. Testing, verification and validation techniques. Process assurance vs. Product assurance. Quality process standards. Product and process assurance. Problem analysis and reporting. Statistical approaches to quality control.

Prerequisites: SAD301

SAD440 Graduation Project (1)

This course requires the students, working in teams, to take an actual project from the initial proposal stage through the preliminary design phase. Students will conduct the necessary activities and prepare the various documents needed to complete the preliminary design.

Prerequisites: 100 Credits

SAD450 Graduation Project (2)

The design process will continue from the preliminary phase to the completion of a conceptual design of the project. The students, working in teams, will prepare requirements, design, implementations of the project. A list and general description of the many details and other miscellaneous activities required to complete the project will also be prepared.

Prerequisites: SAD440.

SAD230 Field Training (I)

The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

Prerequisites: 60 Credits.

SAD340	Field Training (II)	1 (0,0,3)

1 (0,0,3)

3 (0,6,0)

4 (0,8,0)

The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

Prerequisites: 90 Credits.

SAD313 Information Storage and Management

The course provides a comprehensive understanding of the varied storage infrastructure components in classic and virtual environments. It enables participants to make informed decisions in an increasingly complex IT environment. It provides a strong understanding of underlying storage technologies and prepares students for advanced concepts, technologies, and products. Students will learn the architectures, features, and benefits of intelligent storage systems; storage networking technologies such as FC SAN, IP SAN, NAS, and object-based and unified storage; business continuity solutions such as backup and replication; the increasingly critical area of information security and management, and the emerging field of computing.

Prerequisites: BCS105

SAD314 Social Media & Digital Marketing

This course lays the foundation of social media marketing. The student will learn what social media marketing entails, including the history and the different social media channels that exist. learn how to select a social media channel that fits your needs, set goals and success metrics, and determine who your target audience is. how to create social media policies.

Prerequisites :non

SAD315 Open-Source Software Development

Introduces concepts, principles and applications of open-source software. Discuss about opensource software development process. Cover economy, business, societal and intellectual property aspects of open-source software. Obtain hands-on experiences on open-source software and related tools through developing various open-source software applications such as mobile applications and Web applications.

Prerequisites: BCS103

SAD316 Software Design and Architecture

Topics covered include: Continuation of the study of design patterns, frameworks, and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs. Basics of software evolution, reengineering, and reverse engineering

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

Prerequisites: SAD301

SAD417 Software Construction

General principles and techniques for disciplined low-level software design. BNF and basic theory of grammars and parsing. Use of parser generators. Basics of language and protocol design. Formal languages. State-transition and table-based software design. Formal methods for software construction. Techniques for handling concurrency and inter-process communication. Techniques for designing numerical software. Tools for model-driven construction. Introduction to Middleware. Hot-spot analysis and performance tuning.

Prerequisites: SAD301

SAD418 Advanced Databases

The main objective of this course is to provide students with an in-depth understanding of the design and implementation of database systems and the administration features of any DBMS. Topics Include: Review of Relational model, E-R Diagramming, Normalization, SQL, Review of Relational Algebra, Query Processing and Optimization, Transaction Processing, Concurrency Control and Recovery, Database Security and Authorization, Database Architectures, Distributed Databases: Architecture, Distributed transaction processing, Object Oriented Databases, Data Warehousing: Heterogeneous component systems, data scrubbing, DW Design. On-Line Analytical Processing (OLAP). Upon successful completion of this course, students will have advanced skills to effectively develop, implement and manage medium to large-scale database management systems.

Prerequisites: BCS204.

SAD419 Ethical Hacking

This course includes: How hackers launch attacks on different systems, computers, users, websites and wireless networks. What tools hackers use, why, and how they work How to protect against these attacks. How to build your own security and hacking tools .How to create you own Ethical Hacking tool portfolio.

Prerequisites :non

SAD420 Cloud Computing

This course contains overview of Distributed Computing: Trends of computing, introduction to distributed computing, next big thing: Cloud computing. Cloud computing properties and characteristics, service models, deployment models. Attributes of Cloud computing: Multi-tenancy – a single instance of software or other computing resource serving several clients, massive scalability – ability to support hundreds of thousands of clients at the same time, elasticity – ability to grow or contract on demand, on-demand self-provisioning of resources. Infrastructure -as-a-Service (IaaS): Introduction to IaaS, resource (i.e., server, storage and network) virtualization, case studies. Platform-as-a-Service (PaaS): Introduction to PaaS. Cloud platform, management of computation and storage, case studies. Software-as-a-Service (SaaS): Introduction to SaaS, Web services, Web 2.0, Web OS, case studies. Cloud issues and challenges: Cloud provider lock-in or vendor lock-in, security of Cloud computing.

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

Prerequisites: BCS105.

SAD421	Enterprise Architecture	3 (2,0,3)
This course	explores the characteristics, selection, implementation, and mana	agement of
enterprise a	architecture frameworks, focusing primarily on the evaluation and	planning of
information	systems from a top-down perspective. Major topics include enterprise a	rchitecture,
Web 2.0, En	terprise 2.0, social media and networking, software as a service, content m	nanagement
systems, clo	ud computing, and portals; each is studied in terms of its characteristics a	nd potential
applications	within an organization.	
Prerequisites	: SAD301.	

SAD422 Big Data Analytics

This course is to understand why the Big Data Era has come to be. This course focusses on the terminology and the core concepts behind big data problems, applications, and systems. It provides an introduction to one of the most common frameworks, Hadoop, that has made big data analysis easier and more accessible -- increasing the potential for data to transform our world Prerequisites: BAS201.

SAD423	Data Mining								3 (2,0,3	3)
The content	s of this cours	e include 🛛	<pre>Knowledge</pre>	discov	ery in <mark>d</mark> a	atabase	es, Data mi	ning p	rocess, [Data
cleaning an	d preparation	, mining a	association	rules,	Classifi	cation,	Prediction	, Clust	tering, \	Neb
mining, App	lications of da	ta mining,	Mining ad	vanced	databa	ses				
Droroquicitor	· BV2301									

Prerequisites: BAS201.

SAD424 **Internet of Things**

We are living in a world where everyday objects, such as smartphones, cars, TVs, and even refrigerators, are becoming smarter and constantly connected to each other to build, operate, and manage the physical world. This emerging paradigm, namely the Internet of Things (IoT), has great potential to impact how individuals live and work by providing a source of innovative decision making. The design of the IoT, which is defined as "an internetwork of physical items – each embedded with sensors - that are connected to the Internet", requires the understanding of embedded electronics, software, sensors, network, and data analytics. To prepare our students as forerunners of this future, this course will introduce a wide range of topics in the broad areas of IOT, and provide hands-on experiences via a series of exciting projects.

Prerequisites: BCS105

SAD425 Agile Methods

The Agile Methods course will address what agile methods are, how they are implemented (correctly), and their impact on software engineering. A variety of agile methods will be described, but the focus will be on Scrum and Extreme Programming. Issues associated with planning and controlling agile projects, along with the implications of empowered teams on the customer supplier dynamic, will give a fuller picture of how the agile practices are realized. The course will conclude with a discussion of some of the issues facing organizations adopting agile methods Prerequisites: SAD301

3 (2,0,3)

3 (2,0,3)

SAD426 Software Engineering 2

The main objective of this course is to provide students with Critical systems: dependability, critical systems specification, critical systems development. Verification and validation: software testing, critical system validation. Management: managing people, software cost estimation, quality management, processing improvement. Evolution: legacy systems, software change, software re-engineering. Configuration management.

Prerequisites: SAD301

SAD427 Distributed Systems

The goals of this course are twofold: First, students will gain an understanding of the principles and techniques behind the design of distributed systems, such as locking, concurrency, scheduling, and communication across networks. Second, students will gain practical experience in designing, implementing, and debugging real distributed systems. The major themes this course will teach include process distribution and communication, data distribution, scheduling, concurrency, resource sharing, synchronization, naming, abstraction and modularity, failure handling, protection from accidental and malicious harm, distributed programming models, distributed file systems, virtualization, and the use of instrumentation, monitoring and debugging tools in problem solving. As the creation and management of software systems is a fundamental goal of any undergraduate systems course, students will design, implement, and debug large programming projects. Students will learn the design and implementation of today's popular distributed system paradigms, such as Google File System and MapReduce.

Prerequisites: BCS310.

SAD428 Game Development

Game Programming and Design is an introductory course to video game programming, 2D and 3D design, and video game art. Students will learn the principles and practice of modeling in polygons, applying textures and materials to those models, and rendering them with appropriate lighting. The models, characters, and images created will be optimized for game engines. Students will also add game audio sound effects and music. This course provides a solid foundation in the essentials of game design and the process of creating game assets. This is a Technology Applications course. Offered at Career Center East Only.

Prerequisites: BCS103

SAD429	Software Engineering for Internet Applications
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The essentials background of the Internet methods and techniques that support the development of Internet-based applications. Life cycle models for developing Internet-based applications, advanced software technologies for Internet applications to produce Web-Enabled applications (using Open Source Software) e.g., distributed object systems, application servers, web technologies, quality assurance for web applications, design and code inspections. The objective of the course is to understand (Protocols, domains,

addressing, infrastructure, and accessing

Prerequisites: SAD301

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

SAD430 Human Computer Interaction

3 (2,0,3)

the topics studied are the design and evaluation of effective user interaction designs, including principles and guidelines for designing interactive systems. Additionally, much emphasis is given to the development process for user interaction designs as an integral, but different, part of interactive software development. User interaction development activities include requirements and task analysis, usability specifications, design, prototyping, and evaluation. It is a goal of this course to help students realize that user interface development is an ongoing process throughout the full product life cycle, and developing the human-computer interface is not something to be done at the last minute, when the "rest of the system" is finished.

Prerequisites: BCS103



برنامج الواقع الافتراضي والمعزز VIRTUAL AND AUGMENTED REALITY PROGRAM (VAR)

VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM

MISSION

The "Virtual and Augmented Reality" program is committed to preparing a scientifically and practically distinguished graduate who is able to compete in the job market with his high capabilities and skills in virtual reality and augmented reality.

MAIN GOALS

Recent advances in computer graphics, sensors and screen technology give us unprecedented possibilities to completely immerse humans in virtual environments or augment real environments. Virtual Reality (VR) and Augmented Reality (AR) constitute a completely new computing paradigm finding its way into applications for industry, health care, education, entertainment etc. This program aims at educating qualified professionals who can design, implement and evaluate VR and AR applications while also considering the ethical, cultural, and social implications of such technology.

The program offers a truly holistic approach to VR and AR technology in a world-class, multidisciplinary research and learning environment. Courses in e.g. computer graphics, image analysis, interaction design, VR and AR are blended into a unified learning experience that covers the whole range from enabling technologies to the final user experience of VR/AR applications. At the core of the program is the assumption that VR/AR technology is best learned when students fuse theoretical knowledge and technical skills with design thinking. This specifically means that active experimentation is a fundamental pillar of the program. This program aims to produce a new generation of VR creators who are able to take a lead in defining this new medium. Our graduate will be strongly interdisciplinary, bringing an understanding of the science and technology of VR to their innovative creative practice. The objectives of the a virtual and augmented reality program can be summarized as follows:

- 1. An interdisciplinary understanding of Virtual and Augmented Reality encompassing psychology, technology and creative practice.
- 2. Strong technical development skills that enable a personal VR and AR creation practice
- 3. Strong transferable skills, in particular the ability to work independently and in groups and to reflectively evaluate their own work.

VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM COURSES CLASSIFICATION AND PERCENTAGES

#	Subject Area	CR	%
А	Univ. Requirements (Humanities and Social Sciences)	12	8.82%
В	Mathematics & basic Sciences	24	17.65%
C	Basic Computing Sciences (Institution Requirements)	36	26.47%
D	Applied Computing Sciences (specialization)	51	37.5%
E	Training	6	4.41%
F	Projects	7	5.15%
		136	100



VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM LIST OF COURSES

Code	Course	CR	Lec	Tut	Lab	Pre Req.					
	(A) Humanities & Social Science (Univ. Req.) (12 Credits)										
GEN000	English Language (A remedy course)	0	0	0	0						
GEN201	Transparency & Human Rights	1	1	•	0						
GEN301	Current Social Issues in Egypt	1	1	0	0						
GEN401	Professional Ethics	2	1	2	0						
GEN10X	Elective (1) From Language Courses List	2	1	2	0						
GEN104	History of Science, Engineering & Technology	2	2	0	0						
GEN202	Communication & Presentation Skills	2	1	0	3						
GEN407	Entrepreneurship	2	1	2	0						
	(B) Mathematics & basic Science Cou	rses (2	4 Credit	ts)							
BAS120	Differential and Integral Calculus	3	2	2	0	-					
BAS121	Physics	3	2	0	3	-					
BAS122	Discrete Mathematics	3	2	2	0	-					
BAS123	Linear Algebra	3	2	2	0	-					
BAS124	Electronics	3	2	0	3	-					
BAS201	Probability and Statistical Methods	3	2	2	0	-					
BAS203	Differential Equations	3	2	2	0	BAS120					
BAS209	Statistical Analysis	3	2	2	0	BAS201					
	(C) Basic Computing Sciences (Institution Require	ements) cours	es (36 C	Credits	;)					
BCS101	Computer Science Fundamentals	3	2	0	3	-					
BCS102	Structured Programming	3	2	0	3	-					
BCS103	Object Oriented Programming	3	2	0	3	BCS102					
BCS204	Fundamentals of Databases	3	2	0	3	BCS206					
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101					
BCS206	Data Structures	3	2	0	3	BCS102					
BCS207	Logic Design	3	2	0	3	BAS124					
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206					
BCS209	Computer Architecture	3	2	0	3	BCS207					
BCS210	Operating Systems	3	2	0	3	BCS101					
BCS311	Artificial Intelligence	3	2	0	3	BAS122, BAS201					
BCS112	Technical Report Writing	3	2	2	0	-					

(D) Applied Computing Sciences (specialization) courses (51 Credits)								
VAR301	Intro. to Virtual and Augmented Reality Technologies	3	2	0	3	BCS101		
VAR302	Game Design	3	2	0	3	-		
VAR303	Mobile Application Development	3	2	0	3	BCS103		

VAR304	Machine Learning	3	2	0	3	BCS311
VAR305	Computer Graphics	3	2	0	3	BAS123
VAR306	Foundation in 3D Modelling	3	2	0	3	-
VAR307	Virtual Reality Platform Development	3	2	0	3	VAR301
VAR308	Human Computer Interaction	3	2	0	3	BCS103
VAR409	Image Processing	3	2	0	3	BAS123
VAR410	Skills and Principles for Animation	3	2	0	3	VAR306
VAR411	Computer Vision	3	2	0	3	VAR409
VAR412	Programming AI for Games	3	2	0	3	BCS311
VAR3xx	Elective (2) (Elective Courses List)	3	х	х	х	ххх
VAR4xx	Elective (3) (Elective Courses List)	3	х	х	х	ххх
VAR4xx	Elective (4) (Elective Courses List)	3	х	х	х	ххх
VAR4xx	Elective (5) (Elective Courses List)	3	х	х	х	ххх
VAR4xx	Elective (6) (Elective Courses List)	3	x	х	х	ххх
	(E) Training (6 Credits))				
VAR230	Field Training (I)	3	0	0	6	60 Credits
VAR340	Field Training (II)	3	0	0	6	90 Credits
	(F) Projects (7 Credits)					
VAR440	Graduation Project (1)	3	0	6	0	100 Credits
VAR450	Graduation Project (2)	4	0	8	0	AIM440
	Elective Courses					
VAR313	Game Engines	3	2	0	3	BCS101
VAR314	Augmented Reality Platform Development	3	2	0	3	VAR301
VAR315	Mixed Reality	3	2	0	3	VAR301
VAR316	Interaction Design	3	2	0	3	VAR301
VAR417	Mathematical Elements for Games and Animation	3	2	0	3	VAR302
VAR418	UI/UX Design	3	2	0	3	VAR308
VAR419	Digital Multimedia Design	3	2	0	3	VAR308
VAR420	Image Analysis	3	2	0	3	VAR409
VAR421	Internet of Things	3	2	0	3	BAC105
VAR422	High performance computer graphics	3	2	0	3	VAR305
VAR423	Web Development	3	2	0	3	BAC102
VAR424	Game Architectures	3	2	0	3	VAR302
VAR425	Special Topics in Virtual and Augmented Reality	3	2	0	3	VAR301
VAR426	Sound Design for Immersive Technologies	3	2	0	3	VAR301

VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM STUDY PLAN

VIRTUAL AND AUGMENTED REALITY (VIR) PROGRAM

1st Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN104	History of Science, Eng. & Technology	2	2	0	0	-
BAS120	Differential and Integral Calculus	3	2	2	0	-
BAS121	Physics	3	2	0	3	-
BAS122	Discrete Mathematics	3	2	2	0	-
BCS101	Computer Science Fundamentals	3	2	0	3	-
BCS102	Structured Programming	3	2	0	3	-
		17	12	4	9	

SECOND SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN10X	Elective (1) From Language Courses List	2	1	2	0	
BAS123	Linear Algebra	3	2	2	0	-
BAS124	Electronics	3	2	0	3	-
BCS103	Object Oriented Programming	3	2	0	3	BCS102
BCS105	Computer Networks Fundamentals	3	2	0	3	BCS101
BCS112	Technical Report Writing	3	2	2	0	-
		17	11	6	9	

VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM

2nd Level

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN202	Communication & Presentation Skills	2	1	0	3	
GEN201	Transparency & Human Rights	1	0	•	0	
BAS201	Probability and Statistical Methods	3	2	2	0	-
BAS203	Differential Equations	3	2	2	0	BAS120
BCS206	Data Structures	3	2	0	3	BCS102
BCS207	Logic Design	3	2 0 3		3	BAS124
		15	9	4	9	

FIRST SEMESTER

SECOND SEMESTER

		Cre	Contact Hours				
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
BAS225	Statistical Analysis	3	2	2	0	BAS201	
BCS204	Fundamentals of Databases	3	2	0	3	BCS206	
BCS208	Design and Analysis of Algorithms	3	2	0	3	BCS206	
BCS209	Computer Architecture	3	2	0	3	BCS207	
BCS210	Operating Systems	3	2	0	3	BCS101	
		15	10	2	12		

SUMMER SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
VAR 230	Field Training (I)	3	0	0	6	60 Credits

STUDY PLAN FOR VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM

3rd Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN301	Current Social Issues in Egypt	1	1	0	0	
BCS311	Artificial Intelligence	3	2	0	3	BAS122+ BAS201
VAR301	Virtual and Augmented Reality Technol.	3	2	0	3	BCS101
VAR302	Game Design	3	2	0	3	-
VAR303	Mobile Application Development	3	2	0	3	BCS103
VAR305	Computer Graphics	3	2 0 3		3	BAS123
		16	11	0	15	

SECOND SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
VAR304	Machine Learning	3	2	0	3	BCS311
VAR306	Foundation in 3D Modelling	3	2	0	3	-
VAR307	Virtual Reality Platform Development	3	2	0	3	VAR301
VAR308	Human Computer Interaction	3	2	0	3	BCS103
VAR 3xx	Elective (2) (Elective Courses List)	3	2	0	3	
		15	10	0	15	

SUMMER SEMESTER

		Cre	Contact Hours			
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
VAR340	Field Training (II)	3	0 0 6 90 Crec		90 Credits	

STUDY PLAN FOR VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM

4th Level

FIRST SEMESTER

		Cre	Con	tact Ho	ours	
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites
GEN401	Professional Ethics	2	1	2	0	
VAR409	Image Processing	3	2	0	3	BAS123
VAR410	Skills and Principles for Animation	3	2	0	3	VAR306
VAR 4xx	Elective (3) (Elective Courses List)	3	2	0	3	
VAR 4xx	Elective (4) (Elective Courses List)	3	2	0	3	
VAR 440	Graduation Project (1)	3	0 6 0		0	100 Credits
		17	9	8	12	

		Cre	Contact Hours				
Code	Subject	edits	Lec.	Tut.	Lab.	Prerequisites	
GEN407	Entrepreneurship	2	1	2	0		
VAR411	Computer Vision	3	2	0	3	VAR409	
VAR412	Programming AI for Games	3	2	0	3	BCS311	
VAR 4xx	Elective (5) (Elective Courses List)	3	2	0	3		
VAR 4xx	Elective (6) (Elective Courses List)	3	2	0	3		
VAR 450	Graduation Project (2)	4	0	8	0	VAR 440	
		18	9	10	12		

SECOND SEMESTER



VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM COURSE DESCRIPTIONS



VIRTUAL AND AUGMENTED REALITY (VAR) PROGRAM **COURSE DESCRIPTIONS**

VAR301	Virtual and Augmented Reality Technologies	3 (2,0,3)
The course	e presents a review of current Virtual Reality (VR) and Augm	ented Reality (AR)
technologie	es and provides a detailed analysis of the engineering, scientific and	functional aspects
of both tech	hnologies. This course covers the technical and experiential design f	oundation required
for the impl	lementation of immersive environments in current and future virtu	al, augmented, and
mixed realit	ty platforms. The course also introduces the development and built	ilding of virtual and
augmented	l environments, with their visualization and interaction interfaces.	During the course,
students w	vill develop VR/AR prototypes, demo experiences, immersive	platforms, unique
controllers,	, and new innovative technologies. The aims of this course a	re to demonstrate
contextual a	awareness and understanding of the VR/AR industry, its application	ions and its client's
needs. Und	derstand the value and utility of research in VR/AR developme	nt. Apply the core
production	process for VR/AR development, including asset production, desig	gn, implementation
and testing.		
Prerequisites	s' BCS101	

Game Design

3 (2,0,3) This course is an introduction to the primary concepts of gaming, and an exploration of how these basic concepts affect the way gamers interact with games. In this course, the student will understand what defines a "game" and the mechanics and rules behind different types of games. you'll learn ways to create and describe a game concept, and specifically what makes a compelling game. This course focuses on the conceptual underpinnings of games.

Prerequisites: ---.

VAR302

VAR303	Mobile Application Development	3 (2,0,3)
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This course introduces students to programming technologies, design and development related to mobile applications. Topics include accessing device capabilities, industry standards, operating systems, and programming for mobile applications using an OS Software Development Kit (SDK). Upon completion, students should be able to create basic applications for mobile devices. Prerequisites: BCS103.

VAR304	Machine Learning	3 (2,0,3)		
This course provides a broad introduction to machine learning and statistical pattern recognition.				
Topics include: supervised learning (generative/discriminative learning, parametric/non-				
parametric	learning, neural networks, support vector machines); unsupervise	ed learning		
(clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs,				
practical advice); reinforcement learning and adaptive control. The course will also discuss recent				
applications of machine learning, such as to robotic control, data mining, autonomous navigation,				
bioinformatics, speech recognition, and text and web data processing.				

Prerequisites: BCS311.

VAR305 Computer Graphics

Basic principles and techniques for computer graphics on modern graphics hardware. Students will gain experience in interactive computer graphics using the OpenGL API. Topics include: 2D viewing, 3D viewing, perspective, lighting, and geometry. This course will introduce students to all aspects of computer graphics including hardware, software and applications. Students will gain experience using a graphics application programming interface (OpenGL) by completing several programming projects.

Prerequisites: BAS123.

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This course	provides an introduction of a	creating, editing,	, and analyzing 3D models	s. It develops
foundation	al skills to work with, and nav	vigate the digital	3D modeling workspace	to create 3D
objects. Th	e couese examines basic eler	ments of the 3D	development of modelir	ng, texturing,
lighting, ani	mating, and rendering.			

Prerequisites: ---.

VAR306

VAR307 Virtual Reality Platform Development

Foundation in 3D Modelling

This course introduces the principles of virtual reality (VR) hardware and software, focusing on current industry standards and applications. Compare and contrast VR applications and discuss their potential uses and limitations. Review an area of VR application or research, exploring the main ideas and technologies, and evaluating current approaches and theories. Evaluate approaches to designing and planning a VR application. Follow an appropriate methodology for designing a VR application.

Prerequisites: VAR301.

VAR308 Human Computer Interaction

In this course, students are introduced to the fundamental theories and concepts of human computer interaction (HCI). Students will gain theoretical knowledge of and practical experience in the fundamental aspects of human perception, cognition, and learning as relates to the design, implementation, and evaluation of interfaces. Topics covered include: interface design, usability evaluation, universal design, multimodal interfaces (touch, vision, natural language and 3-D audio), virtual reality, and spatial displays. In addition to lectures, students will work on individual and team assignments to design, implement, and evaluate various interactive systems and user interfaces based on knowledge culled from class material and additional research.

Prerequisites: BCS103.

VAR409 Image Processing

This course is an introduction to image processing and image analysis techniques and concepts. Areas examined include: Imaging sensors and their principles; Image representation and storage, coding and compression techniques, lossy versus lossless; Techniques for noise reduction. Image enhancement including contrast manipulation, histogram equalization, edge highlighting; Filtering and transform techniques for image processing including two dimensional Fourier transforms, wavelets and convolution; Spatial transformations and image registration. Segmentation and

3 (2,0,3)

3 (2 0 3)

3 (2,0,3)

3 (2,0,3)

thresholding techniques; Applications of morphology to image processing including erosion, dilation and hit-or-miss operations for binary and grey scale images; Image feature estimation such as edges, lines, corners, texture and simple shape measures. Object classification, template matching techniques and basic image based tracking will also be examined.

Prerequisites: BAS123.

VAR410 Skills and Principles for Animation

This course focuses on areas specific to computer animation, such as weight and timing, and central concepts such as emotion. How to use basic animation skills. Demonstrate the basic principles of animation and use a selection of animation and software skills. Co-ordinate files used in different applications. Demonstrate media and file management processes. Apply the principles of animation in an original animation.

Prerequisites: VAR306.

VAR411 **Computer Vision**

This course provides an introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, multiview geometry including stereo, motion estimation and tracking, and classification. Studwnts will develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment (e.g. panoramas), tracking, and action recognition.

Prerequisites: VAR409.

VAR412 Programming AI for Games

Artificial Intelligence is widely regarded in the computer game industry as the area where the most development will be made in the coming decades. This course equips students for a career in the rapidly growing game industry. Students will gain knowledge and skills in AI techniques that also apply to other domains, such as business planning and engineering. The primary focus of this course is on the use of AI techniques for generating efficient, intelligent behaviour in games. Additional attention is given to AI algorithms for improving game play experience.

Prerequisites: BCS311.

VAR440 Graduation Project (1)

This course requires the students, working in teams, to take an actual project from the initial proposal stage through the preliminary design phase. Students will conduct the necessary activities and prepare the various documents needed to complete the preliminary design. Prerequisites: 100 Credits

VAR450	Graduation Project (2)	4 (0,8,0)
The design	process will continue from the preliminary phase to the completion of a	a conceptual
design of t	he project. The students, working in teams, will prepare requireme	nts, design,

3 (2,0,3)

3 (2,0,3)

3 (2,0,3)

3 (0,6,0)

implementations of the project. A list and general description of the many details and other miscellaneous activities required to complete the project will also be prepared. Prerequisites: VAR440

VAR230 Field Training (I) 3 (0,0,6) The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions.

Prerequisites: 60 Credits.

VAR340 Field Training (II) 3 (0,0,6) The student is required to spend three weeks (5 days/each) in an industrial facility for training that is relevant to his/her field of study. The program council will assign a staff member to set the training plan with the industrial partner and to follow up on the student's progress. At the end of the training period, the student is required to submit a report and give a presentation before an examination panel from the department and/or industrial partners. In the report and presentation, the student would highlight the achievements and/or challenges she/he has gone through during the training period. 60% of the student's score is provided by the industrial training supervisor and the remaining 40% is determined based on: the student's report, final presentation, and how well the student responds to the examination board questions. Prerequisites: 90 Credits.

VAR313 Game Engines This course provides students with an in-depth exploration of game engine architecture. Students will learn the fundamentals of the modern game major, including interactive computer applications. Students will learn game engine design and patterns. Through the course, the student will be introduced to some engine architectures from actual games and explore the impact of the game design on the engine architecture. Through the course, students will work on applying a game concept using the game engine.

Prerequisites: BCS101.

VAP214 Augmented Peoplity Platform Development

VANJI4	Augmented Reality Flatform Development	5 (2,0,5)		
The course will introduce the difference between augmented reality, augmented virtuality, and				
virtual realit	y. The course will explain the fundamental building blocks of AR applicatio	ns. Students		
will investig	ate the use of image processing and HCI to enhance the AR $$ application. S	students will		
work on a p	ractical project to deploy the AR concepts on a working prototype.			
Prerequisites	: VAR301.			

3 (2,0,3)

2 (2 0 2)

This course provides basic concepts in human-computer interaction, including design principles

Interaction Design

develop a working prototype.

Prerequisites: VAR301.

Mixed Reality

and evaluation methods for user interfaces. The course explains the role of human-computer interaction within system development. Students will be able to analyze and evaluate design solutions based on the users' needs in a particular context. Students will explore principles, patterns, and processes for interaction design, rapid prototyping, user interface (UI), and user experience (UX) design. The student will work on practical application prototypes, including sketching, storyboarding, wireframing, prototyping.

Augmented Reality, and Augmented Virtuality. The course presents an introduction to XR using a broadly chronological approach, focusing on how all of the underlying technologies came together. Students will learn the use of each underlying technology and its constraints and challenges. The course will provide practical training on the engine platform, enabling students to

Prerequisites: VAR301.

VAR315

VAR316

VAR417	Mathematic	al Elemen	ts for Game	s and A	Inimation	ו		3 (2,0,3)
This course	explains the	mathemat	tical science	behin	d 2D, 3D	graphics	, animation,	sound, and
collision det	tection. The c	ourse tea	iches studer	nts line	ear physio	cs, simple	e harmonic i	motion, and
rotational p	hysics. It intro	duces fluio	ds mathema [.]	tics, nu	merical n	nethods,	and physical	simulations.
Students wi	ll be to implen	nent algor	ithms for ga	me eng	gine visua	als and ar	imation.	
Prerequisites	· VAR302							

VAR418 UI/UX Design

Every digital interface/interaction (e.g. web and mobile application, car dashboard, smart appliance) was designed to solve a problem or to make our lives better, easier, more successful. Every time you use your phone, the buttons you push, the gestures to swipe up, down, left right, the font choices, the color scheme—all these were designed by a UI/UX designer. In other words, UI/UX is the communication layer between the computer software and the user. This course, explores the principles and practice of user interface and user experience design for digital platforms. Digital tools like figma, mural, notion, and slack can be used to design in teams. They are intuitive to use and create a bit of delight along the way. you will summarize and demonstrate all stages of the UI/UX development process, from user research to defining a project's strategy, scope, and information architecture, to developing sitemaps and wireframes. You'll learn current best practices and conventions in UX design and apply them to create effective and compelling screen-based experiences for websites or apps.

Prerequisites: VAR308.

VAR419	Digital Multimedia Design	3 (2,0,3)
This course	covers topics that utilize contemporary methods for digitally designing	multimedia.
Students wi	Il learn how to digitally create multimedia and prepare it for various e	nd products

3 (2,0,3)

3 (2,0,3)

3 (2,0,3) This course introduces the concept of the new XR technologies, including Virtual Reality, including print and web. Topics will include digital camera functions, image capturing techniques, digital image editing, 2D computer animation, Flash video creation, XHTML, Web 2.0 tools, and web page design. Students will have the opportunity to apply and demonstrate proficiency in concepts learned in class by engaging in projects and activities assigned to give them experience using various forms of media to solve real-world problems. Each student will exit the course with an interactive digital portfolio of his or her work.

Prerequisites: VAR308.

VAR420 Image Analysis The main aim of the course is to give a basic introduction to the algorithms and mathematical methods used in image analysis, to an extent that will allow the student to handle industrial image analysis problems. In addition the aim is to help the student develop her or his ability in problem solving, both with or without a computer. Imaging geometry, image filtering, segmentation techniques, image representation and description, stereo vision and depth measurements, texture analysis, dynamic vision and motion analysis, matching and recognition.

Prerequisites: VAR409.

VAR421 Internet of Things

The overall goal of this course is to enable you to build an IoT system from the ground up. Note, this is an IoT system; as you'll learn, there's extensive variety insofar as what an IoT system can be. That said, during this course, you'll learn the various kinds of IoT systems that student will encounter and build one using representative technologies. Describe what IoT is and how it works today. Recognize the factors that contributed to the emergence of IoT. Design and program IoT devices. Use real IoT protocols for communication. Secure the elements of an IoT device. Design an IoT device to work with a Cloud Computing infrastructure.

Prerequisites: BCS105.

VAR422	High performance computer graphics			
This course	is about generating 3D graphics for interactive applications using custo	om graphics		
hardware such as Graphics Processing Units (GPUs). The course will cover how a GPU works and				
how to program a GPU for applications such as games from mobile platforms right up to high end				
graphics fro	m AMD/ATI and Nvidia			

Prerequisites: VAR305.

VAR423 Web Development

This course will present students with the information and skills needed to build dynamic, datadriven websites using databases, front-end frameworks and server-side programming. This course provides the skill set required to do full stack web development work. It starts from basic level and moved toward advanced tools and techniques of web development. Program is covering HTML5, CSS, WordPress, PHP, MySQL, eCommerce Shopping Cart, working with WordPress Website Themes, Website Design Concepts and common tasks need for deployment and administration of a website

3 (2,0,3)

3 (2,0,3)

Prerequisites: BCS102.

VAR424 Game Architectures

This course investigates the theory and practice of developing computer games from a blend of technical, aesthetic, and cultural perspectives. Technical aspects of game architecture include software engineering, artificial intelligence, game physics, computer graphics, and networking. Aesthetic and cultural include art and modeling, sound and music, game balance, and player experience.

Prerequisites: VAR302.

VAR425 Special Topics in Virtual and Augmented Reality 3 (2,0,3)

Topics are selected from different areas in virtual and augmented reality that are not covered in the description of the courses listed in the curriculum. This course will cover recent trends and issues in the field of VR/AR and will be chosen at the discretion of the Department Council and the Faculty Council.

Prerequisites: VAR301.

VAR426 Sound Design for Immersive Technologies

The course covers both the technical and aesthetic aspects of designing, producing and sourcing sound for immersive technologies and 3D environments. Topics may include: Core concepts: Digital Audio - Understanding the key elements in sound design - Basic Acoustics & psychoacoustics - Core concepts - Game Audio - Spatial Audio (tools & pipelines) - Microphones and mic placement techniques - Portable recording equipment & audio interfaces - Digital Audio Workstation (D.A.W.) - editing & production skills - Recording & producing Voice - Recording & producing Foley / Sound FX - Time-based Effects / Frequency-based Effects / Gain-based Effects - Using sound effects libraries - An introduction to MIDI & virtual instruments / plugins - Audio middleware for game sound

Prerequisites: VAR301.

3 (2,0,3)